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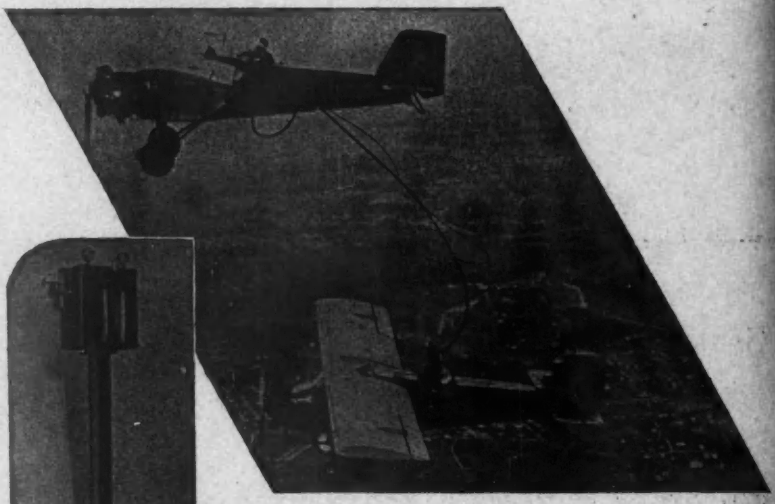

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CANADIAN PUBLIC HEALTH JOURNAL

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Control of Communicable Diseases in Rural Areas by Immunization*

F. W. JACKSON, M.D., D.P.H.

Deputy Minister of Health and Public Welfare, Manitoba

IN the control of communicable disease in rural areas immunization is playing an ever-increasing part. To Jenner belongs the glory of having demonstrated the effectual use of our first immunizing agent and, although this was based on observation rather than scientific experimentation, it stands today pre-eminently as the most valuable means at our disposal for procuring immunization against any one communicable disease. In it we have the highest point in immunization efficiency—but vaccination has brought its problems with it, and the very completeness of our control over smallpox has made the people grow more careless as the years have gone on, so that they now consider it a greater hardship for an individual to be vaccinated than to run the chances of contracting the disease. The ravages of smallpox are almost forgotten, and considered only the fantastic happenings of the dark ages, which could not occur in these enlightened times. The same will probably hold true of all other immunizing agents.

For many years vaccination against smallpox was the only immunizing agent we had for the control of any of the communicable diseases. With the advent of diphtheria antitoxin a means was placed at our disposal whereby at least a limited control over this condition could be maintained when it should appear in a community. Up until these last few years it was the common practice, and in fact it still is in some places, to give passive immunity by means of diphtheria antitoxin to all individuals in the community who may have come in contact with the source of infection. Ten years ago this was the accepted practice, and it was very seldom, if ever, a member of a household escaped a prophylactic dose of antitoxin when any member of the family was down with diphtheria. Antitoxin, we still think, has its place as an immunizing agent in the control of this disease, particularly in rural areas, and especially in those districts which have not offered their inhabitants protection by means of toxoid.

With the advent of toxin-antitoxin and diphtheria toxoid we have

*Presented at the Annual Meeting of the Canadian Public Health Association, June 19th, 1931.

had placed at our disposal an effectual means of controlling diphtheria in any community.

In rural Manitoba all the known immunizing agents, with the exception of convalescent serum for measles, are in use, and all have been found to be of direct value in the control of communicable diseases.

Vaccination against smallpox has been advocated year by year, and, although not compulsory throughout the whole of the province, it can be made so in any area by order of the board of health, the health officer, or the local school board. We are able to keep reasonably free from the disease by the use of vaccination, although it is alarming to note that fewer communities year by year are making a determined effort to keep all the new members of their districts protected, and one hates to think that it will probably require the appearance in our midst of a malignant type of the disease before the ordinary population wakens up to the fact that we are becoming an unprotected people.

Typhoid fever vaccine is being used extensively in certain sections of rural Manitoba. Two years ago an Act was passed by the Legislature which gave the Minister of Health and Public Welfare power to make vaccination against typhoid and smallpox compulsory in certain designated groups of our people. I refer to mining, lumber and construction camps. This Act specifies that every individual seeking employment in the designated area must produce certificates of vaccination against typhoid fever and smallpox. As yet, only two districts of the province have come under the jurisdiction of this Act; namely, the northern and central Manitoba mining areas. The results, we think, have been very gratifying. The Act was brought into force in these areas in June, 1929, following an epidemic of typhoid which seeded practically the whole of the northern mining area with the disease, and since that time there have only been two cases of typhoid fever, and none of smallpox, reported from this district. The two cases of typhoid occurred in individuals who had not been immunized and had secured employment without the production of the required certificates.

It is our policy now, when a case of typhoid occurs in any district, to advocate the use of typhoid vaccine in all individuals in that territory. In some instances we have had some success, but in the majority of cases it has been very limited. We usually find that by the time a case has been diagnosed and reported, a great many individuals have been in contact with the source of infection, and, as a result, as many as eight or ten cases may occur before the disease is brought under control.

The control of scarlet fever has presented a rather difficult problem. There are many reasons for this, and probably the most important one is that the present type of the disease seems to be quite mild and individuals are loath to run the chance of serum sickness by the use of prophylactic doses of antitoxin, or the reaction due to the use of scarlet fever toxin for active immunization. The plan we have out-

lined, and which is now used pretty generally throughout the province, is as follows: On the appearance of a case of the disease in any school district, the health officer is advised to give the actual contacts of the case prophylactic doses of scarlet fever antitoxin. If the individual has been attending school, we urge that all the children in the school be Dick tested and those with a positive Dick test immediately started on active immunization. This, we have found to be of distinct benefit in limiting the spread of the disease wherever the instructions have been accurately followed out. In many instances the number of cases have been limited to two or three, despite the fact that the contact with the disease has been widespread. It is usually found that any community so immunized will go many years without having the disease appear amongst their people.

I think we will all agree that the greatest stride in immunization methods for the control of communicable disease has been effected by the use of diphtheria toxoid for the prevention of diphtheria.

In Manitoba, the Health Department of the City of Winnipeg started diphtheria immunization in their schools in 1923, but it was not until 1929 that any determined effort was made to have immunization programmes instituted in rural Manitoba.

When the matter was first given consideration, three methods for trying to cover the rural parts of the province presented themselves:

1st: A programme sponsored and paid for by the Department.

2nd: A programme sponsored by the Department, put on by the local governing unit, namely, the municipality, and paid for by the municipality.

3rd: A programme sponsored by the Department, put on by the local practising physicians, and paid for by the individuals receiving the immunization.

We knew there would probably be no objection on the part of any municipalities to the Department putting on the programme and paying for it, but it was thought that the best results would not be obtained by this method, and besides this there was no appropriation to cover the expense of the programme. In the first place, it would be next to impossible to get any local organization to sponsor the project—to create interest and insure its being a success in having the greatest possible percentage of children immunized. It was also felt that there would not be the same incentive for the individual ratepayers to have their children toxoided as the money would not be coming directly out of their pockets.

In certain parts of the province, of course, the Department has to do this work, I refer to unorganized territory, but in these districts we have made it a policy to wait for the demand to come from the area desiring it, and in this way, we have found that practically all the children have been immunized. The Department, of course, accepts responsibility for the whole expense of such programmes.

A trial was also made of having the local physicians endeavour to get their clientele to have their children immunized at a flat rate. This, however, was not an outstanding success, the individual parents delaying the matter for one reason and another. In one municipality where this was done in a relatively thorough manner we found that only about forty per cent of the children between one and fifteen were immunized.

Our greatest success has been secured when we have had the local governing body, that is, the municipal council, put on and pay for the programme in their own municipality, the work being done by the local practising physicians. By this method we find that at least ninety per cent of the school enrolment is protected, and fully seventy-five per cent of the pre-school group where an effort is made to get these out to the immunization centres. In fact, in many municipalities there is closer to 100 per cent of the school children protected.

This method has been particularly successful in our province and there have been immunized to date in rural Manitoba by municipal medical officers of health approximately 40,000 children in a child population between the ages of one and fifteen of approximately 152,000.

Even the present year, with the very grave economic depression throughout the farming sections of the province, sees no abatement in our efforts to have the children immunized, and the results still continue to be successful. During the first five months of this year twelve additional municipalities have put on the toxoid programme, bringing the number of municipalities immunized up to seventy-nine out of a total of one hundred and seventy-five, and we think that fully half of the rural school children will have been protected by the end of the year.

The procedure followed in Manitoba is possibly different to that used in other parts of Canada. No definite attempt was made in the first place to interest individual parents in having their children protected. We thought by going directly to the local governing bodies, that is, the municipal councils, quicker results could be obtained. A certain amount of interest was created in the minds of the people through articles which were released to the press by the Medical Association, and during the course of our campaign we have received a considerable amount of very favourable publicity from our local press; this has helped considerably in "putting the programmes over."

The first step in the programme was the use of a circular letter explaining briefly to the council the method of immunization and the results we hoped to obtain, and asking for permission to discuss the matter personally with them at one of their meetings. A copy of all the correspondence going to the municipal council was sent to the local medical health officer and his co-operation requested—and this we received in every instance. Probably a great deal of the success of the plan is due to the assistance received from the local health officers.

We have found, in practically every instance, where the municipal council has extended an invitation for a member of the Department to attend one of their meetings to discuss the situation, that they have subsequently instituted immunization on the programme. In some few municipalities where the invitation did not come from the council, but from some other source, and where the council was interviewed without a definite invitation, the success in persuading such councils to undertake the programme has been practically nil. In some few municipalities the circular letters and the efforts of the local medical health officers were all that were required to persuade the councils of the advantages of diphtheria immunization and to have them decide in favour of offering this protection to their children.

When any municipality decides to put on an immunization programme, the Department first ascertains the approximate number of families in the territory, then provides the health officer with a sufficient number of circular letters to be sent to the parents, explaining the procedure, with literature attached regarding diphtheria and diphtheria

FORM I

Re Diphtheria Immunization

DEAR MADAM:

Under advice from the Department of Health and Public Welfare, the Municipality of ————————desires to have all their school children protected against diphtheria.

The Department points out that at the present time diphtheria seems to be on the increase, and that if it gets into our community we can expect that at least one out of every ten who contract the disease will die. They inform us that they have a simple method whereby all children and adults, if they so desire, can be protected against this disease. Protection is obtained in a child by giving three injections, three weeks apart, of a substance called toxoid. This substance increases the resistance of persons to the disease, so that by the end of from two to four months following the last injection 90 per cent of the persons so treated will not contract the disease. They advise us that the younger the child is done after the age of one year, the less the reaction. Even in older children, however, only about one out of every ten has any reaction at all, and this is usually of a very mild type, being limited to the site of the injection, and passing off within forty-eight hours.

All pupils enrolled on the school register, all children of school age, and all children between the ages of one and six years, will be protected against diphtheria free of charge.

If you conscientiously object to your child, or children, being so protected, please fill in and sign the form below and return to the school teacher not later than———————— otherwise your consent will be taken for granted.

Yours very truly,

MEDICAL OFFICER OF HEALTH.

I do not wish my children, namely:

.....

.....

.....

To be protected against diphtheria.

Date..... Signature.....

prevention. These letters are sent to the different schools and distributed to the parents by the teachers. You will note by Form I that this specially prepared form letter is what might be called a negative type; that is, unless the parents signify objection to their children being immunized, it is taken for granted that they want them to have the protection.

In the event of an adverse decision being made in this matter by the parents, *i.e.*, that they do not want the immunity to be conferred on their children, they are requested to return the letters to the schools by a certain set date, so that the health officer will have before him a record of the children who are not to have the toxoid.

You will also notice by the letter that we urge the parents to bring their pre-school age children to the schools to receive protection.

As soon as the expiry date has passed, and the schools have been notified by the health officer of the time and date he will hold the clinic, the Department, on advice from him, provides the required amount of toxoid, and delegates a public health nurse to assist him with its administration.

We have made an attempt to standardize the toxoid administration by supplying the nurses, who are assisting the physicians, with a full equipment of syringes, needles and sterilizing apparatus. Each nurse has been instructed in the method we desire used in carrying out the programme. The idea of this, of course, is not that the majority of physicians would not do the work in a proper manner, but we wish to take every precaution possible to see that no untoward results take place. We think this has also been a benefit in that it has indicated to the community that the Department are taking a definite interest in seeing that everything is being done for the protection of their children.

At the end of the three weeks' period after the first dose, the nurse goes out again to assist with the second dose, and three weeks later for the third dose.

The cost of the programme is borne jointly by the municipality and the Department—the only expense to the municipality being the fee charged by the physician doing the work. In an effort to standardize the cost throughout the province, the Manitoba Medical Association was asked to set maximum fees for this work. This the Association did and the fees are as follows: $1.50 per child for the three injections in rural schools, and $1.00 per child for the three injections in town and village schools. If the municipality can arrange for a better rate with their physician, it is to their advantage to do so, but we are now in a position to say that it will not cost them more than this amount. The Department supplies all the toxoid, form letters and literature necessary; also the services of the nurse to assist the local physician.

With a view to keeping the expense of the programme down, we have not urged the use of the reaction test. This would increase the

cost by 33 per cent. In so far as reactions are concerned, we have not had a great many reported, and those which have been reported have been of a minor nature, and have left no untoward results. Some few health officers use the test on the children over twelve, and in the suburban municipality of St. James, all children over twelve were "Schicked" before the administration of the toxoid, and graduated doses of the material used in those with a positive Schick, in which the control showed sensitivity of the individual to the protein in the toxoid.

In those municipalities that have put on this programme we investigate all cases of diphtheria occurring in the territory to ascertain whether or not the individual suffering from the disease received immunization, and if so, when.

It is a little too soon to arrive at any very definite figures as to just what the result of this programme has been, but indications point to the fact that it has had a definite bearing on the amount of diphtheria prevalent in our province last year.

TABLE I

DIPHTHERIA CASES AND DEATH RATES IN MANITOBA BEFORE AND AFTER THE INAUGURATION OF IMMUNIZATION PROGRAMMES AND FREE DISTRIBUTION OF BIOLOGICAL PRODUCTS

1920-1930

Year	Cases	Case Rates	Deaths	Death Rates
1920	1759	295	171	28.8
1921	1785	292	148	24.2
1922	2310	370	150	23.9
1923	2015	321	122	19.2
1923	WINNIPEG STARTED IMMUNIZATION PROGRAMME			
1924	1395	222	98	15.8
1925	1016	160	100	15.8
1926	1077	169	92	14.6
1927	933	144	88	13.6
1928 (May)	MANITOBA STARTED FREE DISTRIBUTION OF BIOLOGICAL PRODUCTS			
1928	972	149	56	8.6
1929	749	112	59	8.8
1929 (Aug.)	RURAL IMMUNIZATION PROGRAMMES STARTED			
1930	586	88	39	5.8

Table I shows the diphtheria cases reported since 1920. You will see that immediately following the commencement of immunization in the Winnipeg schools a distinct drop occurred in the number of cases reported, and also a considerable decrease in the number of deaths. By the end of four years there was a total drop of over 35 per cent in the case rate and a considerable drop in the death rate.

In 1928 there was started the free distribution of diphtheria antitoxin. The result from this is quite apparent in the death rate. It is noticeable that although the case rate did not improve any—in fact,

it was higher than the year previous—the death rate dropped to the lowest in the history of the province until that time.

The rural immunization programme started in 1929 and, although I do not want to draw any conclusions from the figures of 1930 and 1931, I would like to show them to you, as they are, at least, interesting.

TABLE II

CASES AND DEATHS FIRST FOUR MONTHS 1930 AND 1931

1930		1931	
Cases	Deaths	Cases	Deaths
184	20	122	7

Table II shows a comparison of the cases and deaths occurring the first four months of 1930 and 1931.

We are now getting into the position where we will be able to investigate all cases of diphtheria occurring in the province. There have been some twenty-five cases occur in the so-called immunized municipalities, but all but one have occurred in individuals who were not immunized.

In one particular instance, where diphtheria occurred in a family of nine individuals, in a municipality which had offered protection to their children, we have the following report:

Number of members in family, 9; 6 children and 3 adults.

In November, 1930, five children had toxoid, all having three doses. During the last week in December diphtheria made its appearance in this household. Two members, ages seven and eighteen, both females, contracted the disease. These were both individuals who had not had toxoid. One of the five children who had had toxoid developed a sore throat and showed some signs of membrane, but the swab proved negative and the condition cleared up very quickly. He was not reported to the Department as a diphtheria case. All members of this family were equally exposed to infection, no provision being made in the house for isolating the patients, so those children who had received toxoid had an equal chance with the others of contracting the disease.

In regard to this outbreak, the health officer of the municipality informed me last week that not one of the ten individuals who contracted diphtheria had been immunized.

To summarize: In Manitoba, we have found immunization for the control of communicable disease in rural areas to be of the utmost value, and we are of the opinion that in the case of diphtheria, smallpox and typhoid fever, immunizing programmes should be used much more extensively in rural areas than at the present time. We also believe that scarlet fever toxin for active immunization can be of real value in controlling scarlet fever, and is deserving of more consideration than it generally receives.

Further Studies of the Etiology of Acute Intestinal Intoxication in Infants and Children

MARION M. JOHNSTON, M.A., ALAN BROWN, M.B., AND MILDRED J. KAAKE, B.H. Sc.

IN our previous study of so-called acute intestinal intoxication of infants, we concluded that this disease is not caused by masked infection in the middle ear or mastoid antra, but is due to enteral infection with various members of the colon-typhoid dysentery group[1 2 3]. This conclusion was based on the isolation of Gram-negative bacilli which have been cited in the literature as pathogenic, including 14 strains of B. dysenteriae Sonne, from 130 cases of 172 investigated in the period October 15, 1928, to October 16, 1929. Many of these were apparently of etiological significance. The demonstration of homologous agglutinins in the serum of some of the patients was additional evidence in support of our hypothesis.

However, the failure to find bacteria of generally accepted pathogenicity in 42 of the 172 cases studied, in spite of liberal sampling of the non-lactose-utilizing colonies from stool cultures or cultures of other material, indicated the necessity for further and more intensive investigation. The finding of agglutinins in the serum of a patient whose stool culture had yielded no important bacterial species was good evidence that the significant organism was being "missed," and suggested that the examination of a series of stool specimens from each patient might yield more positive results. Accordingly, during the summer and autumn of 1930 the most severe cases amongst the infants have been subjected to a more rigorous examination. At the same time conditions in older children, diagnosed as, or similar to, infantile "acute intestinal intoxication" or "dysentery" have been investigated from a bacteriological and serological standpoint.

Study of Infant Cases

The stools of 67 infants were studied. The time of admission to the Hospital for Sick Children and the diagnosis on admission are shown in Table I. It is seen that the admissions are most numerous in August and September, and that the majority, 53, of the cases were diagnosed as "acute intestinal intoxication."

From the Research Laboratories, Sub-Department of Paediatrics, University of Toronto, and the Hospital for Sick Children, Toronto.

These infants were largely derived from the poorer social classes represented in our previous study[13], the Moss Park district again contributing heavily. All infants were bottle-fed or were receiving soft diet suitable to their age. Twenty-eight were males and 39 females; 15 males (54 per cent) and 9 females (23 per cent) died.

In 63 of the 67 infants there was a history of diarrhœa and vomiting, in three of diarrhœa without vomiting, and in one of vomiting but no diarrhœa. The data with respect to duration of symptoms prior to admission were obtained from the parents and are shown in Table II.

TABLE I

CLINICAL DIAGNOSES

Infants Cases Admitted from July to October, 1930

Month of Admission	Acute Int. Intox.	Infectious Diarrhœa	Fermentative Diarrhœa	Dysentery	Other Diagnoses
July	1	0	0	0	1
August	16	0	0	0	3
September	30	1	2	0	2
October	6	0	2	1	2
Total	53	1	4	1	8

The duration varied from less than one day to over two months, approximately half the cases having symptoms not longer than one week while 49 of the 67 gave a history of onset within two weeks prior to admission. It is probable that in most of the cases with a prolonged history there was an exacerbation of symptoms or a new symptom complex just previous to admission.

TABLE II

DURATION OF SYMPTOMS PRIOR TO ADMISSION

Duration	Days								Months			Unknown	Total
	2 or less	3	4	5	6	7	8–14	15–21	1	1–2	2		
Cases	5	4	5	6	2	11	16	6	3	7	1	1	67

Characteristics of Stools

The number of stools varied from 4 to 20 per day. Out of 47 stools examined, 30 showed blood or pus or both either macroscopically or microscopically. Mucus was observed in the stools of nine of the

remaining 20 cases for which no observations were recorded in regard to blood or pus. Blood and pus or either alone might have been present though not observed in other specimens from the same cases.

The relation of these findings to the clinical diagnoses and the bacteriological findings are summarized in Table III. It will be seen that there is no essential difference in the stools in the various clinical

TABLE III

RELATION OF STOOL CHARACTERISTICS AND BACTERIOLOGICAL FINDINGS TO CLINICAL DIAGNOSIS

Clinical Diagnosis	Stools showing	No.	Bacteriological Findings							
			Sonne	Flexner	Schmitz	Asiaticus	Dispar?	Para Typhoid	Other Bac.	Neg.
Acute Intestinal Intoxication	Blood and pus	9	1	5	5	0	0	1	1	1
	Blood alone	9	4	2	1	0	0	0	3	0
	Pus alone	4	2	1	1	1	0	0	0	0
	Neither	15	1	1	5	0	2	0	5	2
	Not examined	16	0	1	10	2	1	1	3	3
Sub-total		53	8	10	22	2	3	2	12	6
Infectious Diarrhœa	Blood and pus	1			1					
Ferm'ta'tve Diarrhœa	Blood alone	2	1							1
	Not examined	2		1		1				
Sub-total		4	1	1		1				1
Dysentery	Blood alone	1								1
Miscell. Diagnoses	Blood and pus	2	1			1				
	Blood alone	1						1		
	Pus alone	1					1			
	Neither	2			1				1	
	Not examined	2			2					
Sub-total		8	1		3	1	1	1	1	
Totals		67	10	11	26	4	4	3	13	8

diagnoses. It is apparent, too, that definitely pathogenic bacteria have been isolated from the majority of the stools under study, some of which showed blood and pus or either alone, and some did not. B. dysenteriae Sonne was isolated from 10 cases, nine of which showed blood and pus or either alone in the stool and one did not. B. dysenteriae Flexner was isolated from 10 cases, eight of which showed blood and pus or either alone, one did not, and one was not examined. B.

TABLE IV

ASSOCIATIONS OF THE VARIOUS BACTERIOLOGICAL SPECIES IN INFANTS' STOOLS

Species	No. of Strains	Alone	Frequency of association of species in Column 1 with							
			Sonne	Hiss-Russell	Flex-ner	Schmitz	Dis-par?	Asia-ticus	Mor-gani	With other Combinations
B. dys-Sonne..	10	5		1					1	Schmitz and Morgan....3
B. dys.—Hiss-Russell.....	6	1	1			1				Schmitz and Morgan....2 Flex & Schmitz.....1
B. dys.—Flexner.....	5	1				1			2	Hiss - Russell & Schmitz..1
B. schmitzii...	26	4	1	3	1				12	Morgani and Asiaticus...1
B. morgani...	32	10	1		2	12				Hiss - Russell & Schmitz..2 Sonne & Schmitz.....3 Schmitz and Asiaticus...1 Schmitz and Para B.....1
B. asiaticus...	4	2				1				Schmitz and Morgani....1 Fothergill's.1
B. dispar?....	4	4								
Fothergill's bacillus....	1							1		
B. para B....	3	2								Schmitz and Morgani....1

paratyphosus B was cultured from three cases, two of which showed blood and pus or either alone; one was not examined. B. Schmitzii was isolated from 26 stools, eight of which showed blood and pus or either alone, six showed neither on one examination, and 12 were not examined. In eight cases no significant organism was isolated; one of these

TABLE V

BIOCHEMICAL REACTIONS OF THE IMPORTANT NON-LACTOSE-UTILIZING BACTERIA ISOLATED FROM THE STOOL

	Gram.	Mot.	Gas.	Lact.	Dex.	Malt.	Sac.	Xyl.	Man.	Arab.	Indol.	Gel.	Lead Acet.	Lit. Milk	Jordan's Tartrate
B. dysenteriae Sonne.....	−	−	−	+ slow	+	+	+ or −	−	+	+	−	−	−	acid coag.	
B. dysenteriae Flexner....	−	−	−	−	+	+	−	−	+	+ or −	+ or −	−	−	acid alk.	
B. dysenteriae Hiss-Russell.	−	−	−	−	+	−	−	−	+	+ or −	+ or −	−	−	acid alk.	
B. schmitzii...	−	−	−	−	+	−	+ or −	−	−	−	+	−	−	alk.	
*B. dispar(?)..	−	−	−	+ slow	+	−	−	+	−	+	−	−	−	acid coag.	
B. morgani...	−	+ or −	+	−	+	−	−	−	−	−	+	−	+ or −	alk.	
B. asiaticus...	−	−	+	−	+	+	+	+	+	+	+	−	−	alk.	
B. paratyphosus Beta...	−	+	+	−	+	+	−	+	+	+	−	−	+	acid alk.	acid
Fothergill's bacillus....	−	−	+	− or late	+	+	+	+	+	+	+	−	−	acid or acid coag.	

+ = acid reaction in medium containing carbohydrate indicated.

**B. Dispar (?) is a Gram negative bacillus whose biochemical and some carbohydrate reactions are suggestive of the Sonne bacillus in that it is a late-lactose-utilizing, non-motile, bacillus which produces neither gas nor indol, and, after a short preliminary alkalinity slowly acidifies and coagulates litmus milk. No serological relationship to the afore-mentioned species could be shown, however. The description of a bacillus with corresponding characteristics has not been found.*

Nine Flexner strains were tested with the English V. W. X. Y. and Z. Flexner agglutinating sera. 4 strains showed closest relationship to the Y. serum, one to the W. serum, and 4 gave no reaction with any serum.

showed blood and pus, two showed blood alone, two showed neither blood nor pus, and three were not examined. From these data it is evident that blood and pus are not necessarily indicative of dysentery infection but are found with B. asiaticus and B. dispar(?) infections. The data indicate, too, that blood and pus or either alone do not consistently accompany dysentery infection as species of dysentery bacilli, including Flexner and Sonne strains, were isolated from stools showing neither blood nor pus. Summarizing, therefore, dysentery or paratyphoid bacilli were isolated from 21 stools which manifested blood and pus or either alone, from seven which showed neither blood nor pus, and from 14 stools on which no report of this character was recorded. That is, 42 of 63 per cent of the 67 cases investigated have yielded definitely pathogenic organisms, the majority of which were dystentery strains. Species of apparent etiological significance were found unassociated with other recognized pathogens in some cases and, in others, in association with other suggestive organisms as shown in Table IV.

B. morgani was present in about 50 per cent and B. schmitzii in about 39 per cent of the stools. From 17 cases, organisms of less well-established pathogenicity were recovered. From only eight of the 67 investigated, or 12 per cent, no apparently pathogenic species was obtained. This evidence strongly substantiates our previous hypothesis that acute intestinal intoxication, infectious diarrhœa, and dysentery present one clinical picture and are confusing descriptive terms applied to one condition,—an infection of the gastro-intestinal system, the causative organism in the majority of cases belonging to the typhoid dysentery group. The evidence shows, too, that cases of so-called fermentative diarrhœa may be in reality infections of the same type.

The biological characteristics of the various organisms found are shown in Table V.

Serological Results

Agglutination tests were carried out with the sera of 25 patients and various bacterial antigens. Two sera gave positive results in dilutions of 1:320 with their homologous Sonne strains, three sera did not agglutinate the homologous Sonne strains. The sera of three cases from whom no strains were isolated agglutinated the Sonne dysentery bacillus in dilutions of 1:320. Two sera which agglutinated the Sonne bacillus clumped a Flexner antigen in lower dilutions than they did the former antigen. The sera of two cases from whom B. dysenteriae Flexner was isolated agglutinated the homologous culture in dilutions of 1:80 and 1:160. The stool culture of the latter case had also yielded B. dysenteriae Sonne for which no agglutinins could be demonstrated.

No serum agglutinated B. paratyphosus B, B. dispar(?), B. asiaticus, or B. schmitzii. (Manifold and Demonto[4] in India reported the presence of agglutinins for B. schmitzii in the sera of four patients whose stool cultures had yielded this organism. A titre of 1:250 was recorded in one case. Another positive aggluntination with this organism is recorded in the Medical Research Council's System of Bacteriology[5].) As a result of the rather unsatisfactory serological findings in these cases as well as in the previous series, it is proposed to re-examine all available sera in the light of newer knowledge in regard to dissociation and other variable qualities.

STUDIES OF THE GROUP OF OLDER CHILDREN

The stools of 29 older children were submitted for culture. The dates of admission corresponded fairly well in distribution with those of the infant cases, a number being admitted, however, somewhat later in the autumn. Five were admitted in November, two in December. In contrast to the high fatality in infants only one case died—a boy aged four years, who was admitted in August with a diagnosis of intestinal intoxication.

Two cases were diagnosed clinically on admission as intestinal intoxication, 1 as infectious diarrhœa, 5 as diarrhœa (unclassified), 1 as fermentative diarrhœa, 3 as dysentery, 3 as convulsions of unknown origin, 3 as pneumonia; 8 had miscellaneous diagnoses. Three cases developed in the hospital, one being a Sonne infection acquired apparently from the child in the next bed who was suffering with diarrhœa, and from whose stools B. dysenteriae Sonne was isolated and agglutinated by his serum. The age distribution is shown in Table VI.

TABLE VI

AGE DISTRIBUTION IN TWENTY-NINE CHILDREN, 2-12 YEARS OF AGE

Age in years	2-4	5-9	10-12
Number of cases	16	9	4

The majority of this older group of children, as shown in Table VII, had a history of more acute onset of clinical symptoms than was apparent in the infants, as in 16 cases there was a history of symptoms initiated not more than 36 hours prior to admission.

TABLE VII

DURATION OF SYMPTOMS PRIOR TO ADMISSION OF TWENTY-NINE CHILDREN, 2-12 YEARS OF AGE

Time	Not more than 36 hours	4 days	7 days	10 days	Unknown	Total
Cases	16	5	1	3	4	29

TABLE VIII

RELATION OF STOOL CHARACTERISTICS AND BACTERIOLOGICAL FINDINGS TO CLINICAL DIAGNOSIS

Children 2-12 years of age

Clinical Diagnosis	Stools Showing	No.	Pacteriological Findings								
			Sonne	Hiss-Russ.	Flex-ner	Schmitz	Dispar?	Para B	Other Bac.	Neg.
Acute Int. Intox.	Blood alone	1		1						
	No blood no pus	1								1
Inf. Diarr.	Blood and pus..	1		1						
Ferm. Diarr.	Pus alone.....	1							1	
Diarr. Unclassified	Blood and pus..	1		1						
	Blood alone....	2		1					1	
	Pus alone.....	1			1					
	Not examined..	1								1
Dysentery	Blood alone....	1								1
	Not examined..	2	1					1		
Convulsions	Blood and pus..	1	1							
	Blood alone....	1	1							
	Neither.....	1	1							
For Observation	Pus alone.....	1	1							
	Neither.....	1	1							
	Not examined..	1								1
Other Diagnosis	Blood alone....	4	1		1	2				
	Neither.....	2					1			1
	Not examined..	5	3		1	1				
Totals.....	.....	29	10	4	3	3	1	1	2	5

Diarrhœa and vomiting were symptoms of 16 cases, vomiting without diarrhœa of 6 cases, diarrhœa without vomiting of 6 cases. No definite record of diarrhœa or vomiting was obtained in one case. The stools varied in number from 10 to 35 per day in the infections from which Hiss-Russell, Flexner and Schmitz organisms were isolated and from four to six in the cases yielding the Sonne bacillus.

Blood and pus or either alone was observed in the stools of 15 cases. The occurrence of blood and pus or either alone with the relationship to the bacteriological findings is shown in Table VIII. Dysentery bacilli were isolated in 12 of the 15 cases which manifested blood and pus or either alone. In addition, dysentery bacilli were cultivated from the stools of nine cases in which there is no record of the presence of blood or pus. B. paratyphosus B was isolated from one stool which contained neither blood nor pus when examined. Thus 22, or 76 per cent, of the 29 cases had dysentery or paratyphoid infections as evidenced by the isolation from the stools of these organisms.

In no case among the older children was an apparently significant species found in association with any other pathogenic species. This is in striking contrast to the mixtures of species which the study of the infant stools revealed.

Serological Results

The serum of the paratyphoid case agglutinated the homologous culture in a dilution of 1:2560. A dilution of 1:320 of the serum from a case whose stool contained B. dysenteriae Hiss-Russell agglutinated his species. In testing seven sera from cases of B. dysenteriae Sonne nfection, six sera were found positive in dilutions of 1:40 to 1:1280; one was negative. All sera tested gave negative results with B. asisticus and B. schmitzii.

PERSISTENCE OF SYMPTOMS AND INFECTION

Vomiting usually terminated before the stools returned to normal in number and consistence. Diarrhœa ceased more rapidly in older children than in infants. This observation was common to the Sonne, the Flexner and the Schmitz, and the paratyphoid infections. For example, diarrhœa caused by the Sonne bacilli lasted from four to 68 days amongst the infants, and from one to 18 days amongst the older children. Amongst the older children the onset of a Sonne infection was usually very acute and the clinical manifestations terminated within two or three days. However, one Sonne case in the group over two years of age was exceedingly severe and the child was in hospital for more than a month.

By repeated bacteriological examinations it was found that the causal species had disappeared in some cases before the number and consistence of the stools were restored to normal. In other cases the

intestinal symptoms had abated but the etiological agent persisted in the intestine. The latter finding is of significance as a child may be discharged clinically recovered and still be excreting the bacteria which caused his illness. The problem of recovered carriers of dysentery and paratyphoid bacilli, therefore, has an important public health aspect.

Similarity of Hospitalized Cases of So-called Acute Intestinal Intoxication to Diarrhœa of Lesser Severity in Non-Hospitalized Patients.

To the outdoor department of the hospital are brought many mild cases of diarrhœa which, unless the patient's condition becomes sufficiently serious to warrant it, are not admitted to the wards. Visits are made to the homes of these patients by the public health nurses. Of 107 reports which were recorded in August, September and October, diarrhœa was noted in 100 cases. In August there were 34, in September 52, and in October 14 diarrhœa reports—a monthly distribution which corresponds with the incidence of cases of "acute intestinal intoxication" which were admitted to the infant ward. Cultures from eight such babies brought to the outdoor with the complaint of diarrhœa were taken. B. schmitzii was isolated from the stools of three cases and a Sonne strain from one which was finally admitted. The other four cases were negative when examined once.

Physicians in charge of well-baby clinics, stated that the majority of infants brought to their clinics during this same season had diarrhœa. Through the kindness of Doctors Gladys Boyd and Pearl Summerfeldt, cultures were taken from 11 such infants. B. schmitzii was isolated from three, B. dispar(?) from three, B. morgani from two, one of whom also had B. schmitzii. Three cases were negative.

These findings suggest that the bacteriological findings in children hospitalized with diagnoses of acute intestinal intoxication, infectious diarrhœa, fermentative diarrhœa, or dysentry may be representative of the stool bacteriology among non-hospitalized, probably less severely ill children, suffering from "summer diarrhœa." It seems not impossible from evidence submitted in the next paragraph, that the so-called "summer flu" of adults may be also an enteral infection with the species of bacteria which are the cause of gastro-intestinal disturbances in children.

CONTACT CASES

Twenty-eight contacts from eight households were examined while their infants were patients in the hospital. In two families, other members suffered from diarrhœa as did the infant in the hospital. All the members of the family of case 16, five in number, had been ill or were ill with diarrhœa, diagnosed as "summer flu." B. schmitzii, the species isolated from the infants in the hospital, was obtained from the stools of two other members of each of these two families. No other

families reported any illness of a similar nature either prior to or at the time of the visit, but B. schmitzii was isolated from the stool of the father of case 52, whose stool culture yielded the same species. B. dysenteriae Sonne was isolated from the stool of a contact of case 2, whose stool culture was negative but whose serum agglutinated this species of bacteria. Case 44 yielded B. dysenteriae Hiss-Russell in her stool culture; two adult persons in her home also yielded Hiss-Russell dysentery bacilli in their stools, although there was no history of recent diarrhœa.

Carriers of dysentery bacilli, therefore, apparently exist in the adult population and probably serve as the source of infection for the younger members. Schorer[6] has found but a small number of healthy carriers of Flexner bacilli, while the British investigators—Fletcher and MacKinnon[7]—report a larger incidence of carrier amongst British soldiers convalescent from dysentery.

FLY TRANSMISSION

The city public health nurses reported during the summer and autumn on the prevalence of flies in the homes which they visited. As the weeks advanced from early August until late October the number of flies observed in the homes increased until about the middle of September, after which the number decreased. Flies were caught in the home of case 16, a Schmitz bacillus case, whose whole family had been ill with a similar complaint and from two members of which the same species was isolated. The digestive tract of the flies was dissected out and macerated in broth which after incubation for a few hours was transferred to MacConkey plates. Schmitz bacilli were isolated from five flies and, in addition, Hiss-Russell dysentery bacilli from four of the five. The same mixture was isolated from flies caught in a second household, the infant from which had a Schmitz infection. Flies, therefore, probably have a rôle in the distribution of these organisms. The homes in which these studies were made were of an exceedingly poor sanitary type.

THE QUESTION OF THE PATHOGENICITY OF SPECIES

That the paratyphoid Beta bacillus and the Flexner and Sonne species of the dysentery group are pathogenic for man is accepted. Some doubt may still exist with respect to the pathogenicity of the Schmitz bacillus. In spite of lack of unanimity of opinion of the etiological importance of the Schmitz bacillus in dysentery, in the Medical Research Council's System of Bacteriology[11] it is conceded to be "almost certainly" pathogenic. While B. schmitzii occurs frequently in the stools of the cases investigated in this study, the absence of the agglutinins in the patient's sera is striking and does not conform

with the findings in cases of diarrhoea caused by other species of dysentery bacilli or in other diseases such as typhoid fever. The variability of agglutinins for dysentery bacilli is clearly recognized.[8 9 10]

However, when several members of a household are ill at the same time with the same complaint, when examinations of all these persons yields similar cultures, obtainable in abundance, from their faeces, and the organism is not found in controls[2], the etiological significance of the species seems to be more firmly substantiated in spite of lack of serological confirmation.

SUMMARY

In 67 cases of sickness in infants hospitalized under the clinical diagnosis of acute intestinal intoxication in 53, infectious diarrhœa in 1, fermentative diarrhœa in 4, dysentery in 1, and under other terms in 8, the stool characteristics, in regard to blood and pus, are compared with the bacteriological findings and with the clinical diagnoses.

Comparable data are given for 29 older children with similar but more varied diagnoses.

Blood and pus, or either of these, were found as often under one clinical diagnosis as under any other, but were absent in some cases of proven dysentery infection. It is shown, therefore, that the presence or absence of blood or pus is not an infallible criterion on which to base a differential diagnosis.

From the 67 infants, 10 strains of B. dysenteriae Sonne, 6 of B. dysenteriae Hiss-Russell, 5 of B. dysenteriae Flexner, 26 of B. schmitzii, 4 of B. asiaticus, 3 of B. paratyphosus B, 4 of B. dispar(?) were isolated. From the 29 older children, 10 strains of B. dysenteriae Sonne, 4 of B. dysenteriae Hiss-Russell, 3 of B. dysenteriae Flexner, 3 of B. schmitzii, 1 of B. paratyphosus B, 1 of B. dispar(?) were recovered.

Similar organisms were obtained from cases of diarrhœa occurring in infants brought to the outpatient department and to child welfare clinics.

The carrier state of dysentery infection in infants and adults was demonstrated. Flies were shown to be possible vectors of these organisms. The same species of pathogenic organisms was isolated from infants in the hospital and from household contacts who, in some cases only, gave a history of recent diarrhœa.

CONCLUSION

Acute intestinal intoxication is an enteral infection; the term is synonymous with infectious diarrhœa, dysentery, summer diarrhœa, etc. Many cases of so-called "fermentative" diarrhœa are of the same type. The causative organisms are members of the colon-paratyphoid paradysentery group.

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BIBLIOGRAPHY

[1]Brown, A. et al.—*South M.J.*, 1930, Vol. 23, p. 107.
[2]Johnston, M. M. and Brown, Alan—*Canad. M.A.J.*, 1930, Vol. 23, p. 231.
[3]Wishart, D. E. S.—*J.A.M.A.*, 1930, Vol. 95, p. 1084.
[4]Manifold, J. A. and De Monte, A. J.—*Indian J. M. Research*, 1927, Vol. 15, p. 601.
[5]Medical Research Council—A System of Bacteriology, Vol. 4, 1929, Lond. His Majesty's Stationery Office.
[6]Schorer, E. H.—*J.A.M.A.*, Vol. 73, p. 763.
[7]Fletcher, W. and Mackinnon, D. L.—Med. Research Comm. Spec. Rep. Ser. No. 29, 1919.
[8]Menton, J.—*Brit. M.J.*, 1928, Vol. 2, p. 97.
[9]Wyllie, W. G.—*Practitioner*, 1930, Vol. 125, p. 75.
[10]Cruickshank, R.—*Quart. J. Med.*, 1925, Vol. 18, p. 339.
[11]Medical Research Council—A System of Bacteriology, Vol. 4, 1919, Lond. His Majesty's Stationery Office.
[12]Bergey's Manual of Determinative Bacteriology, 3rd ed. 1930, Balt. Williams and Wilkins.
[13]Johnston, M. M. *et al.*—Intestinal infections in infants (in press).

THE WINDSOR HOTEL, MONTREAL, CONVENTION HEADQUARTERS, AMERICAN PUBLIC HEALTH ASSOCIATION, SEPTEMBER 14TH-17TH, 1931.

Grosse Isle Quarantine Station

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THE Canadian Government's quarantine station on the St. Lawrence river is located at Grosse Isle, some thirty miles below the city of Quebec. A brief history of the island is as follows:

Grosse Isle was first established as a quarantine ground by an Act dated February 25th, 1832. This was drawn up with the object of preventing the introduction of Asiatic cholera into Lower Canada. In 1836 another Act was passed "to enable His Majesty to acquire the island called 'Grosse Isle'." In 1853 a further Act was passed entitled "An Act to consolidate laws relative to emigrants and quarantine". This Act applied specifically to the quarantine station at Grosse Isle. All vessels arriving from ports of Europe or elsewhere were obliged to make quarantine "if they had on board at the time of their arrival or during their passage from the places where they respectively cleared any person labouring under Asiatic cholera, fever, smallpox, scarlatina, measles, or other infectious or dangerous disease."

An inspecting physician was appointed at Quebec, who acted as a further barrier to the entry of infection into the country. All persons ill with cholera were to be landed at Grosse Isle.

In 1867 the Quarantine Regulations were amended to provide for a thorough cleansing and disinfection of vessels, goods and passengers, so as to prevent, as far as possible, the introduction or dissemination of disease.

Asiatic Cholera Epidemic

The years 1832, 1834, and 1847 were the most tragic in the history of Grosse Isle. During the two former years the dreaded Asiatic cholera made its appearance in Canada, and wrought great havoc throughout the country. Records show that in the year 1832, 51,700 emigrants from England and Ireland arrived at the port of Quebec, and in every city from which these emigrants came, cholera was epidemic. The disease broke out in the ships on their way across the Atlantic, and there were many burials at sea.

Canada at that time was but poorly prepared to cope with the problem. A few wooden sheds had been put up hurriedly at Grosse Isle and converted into hospitals for the sick, but this accommodation proved inadequate, and most of the sufferers had to be sheltered in tents. The situation was aggravated by inadequate medical attendance and the handicaps incidental to a new establishment, also by the extreme virulence of the disease. Under the circumstances the death toll on the island was heavy, especially in 1832. The epidemic extended

to Quebec, Montreal, and other parts of Canada, where men, women and children succumbed in large numbers.

The first buildings erected on the island in 1832 were all, with one exception, located in the upper part of the island. The buildings in the lower and centre parts of the island date chiefly from 1847. In 1878 three of the largest of these were destroyed by a disastrous fire and many of the quarantine records were lost.

Typhus from Ireland

In the year 1847 following the disastrous Irish potato famine, many thousands emigrated from that country to the United States and Canada. Day by day the American and Canadian public were thrilled by the stories of ships arriving off the harbours reeking with typhus and cholera. Speaking in the British House of Commons in February, 1848, Mr. Labouchere referred to one year's havoc on board the ships sailing to Canada alone in the following words: "Out of 100,000 emigrants who during the last twelve months crossed the Atlantic for Canada and New Brunswick, 6,100 perished on the voyage, 4,100 on their arrival, 5,200 in the hospitals, and 1,900 in the towns to which they repaired. The total mortality was 17 per cent of the number emigrating."

On May 20th, 1847, thirty vessels anchored at Grosse Isle. They left Ireland with 12,519 passengers of whom 777 died at sea and 459 on board at the island. According to official returns the number of emigrants to Canada who died of typhus in 1847 is as follows:

At sea	8,000
At Grosse Isle	5,424

A striking monument was erected at Grosse Isle by the Irish people of Canada to mark the site of the burial grounds. The old stone memorial nearby bears the following inscription: "In this secluded spot lie the mortal remains of 5,424 persons who, flying from pestilence and famine in Ireland in the year 1847, found in America but a grave." This stone also bears mute testimony to the fact that no fewer than six of the doctors who were sent to the island to care for the sick, succumbed to the disease. Many clergymen, nurses, and stewards were also stricken fatally.

The tragic experience of 1832, 1834, and 1847, fortunately, has never recurred. A survey of the history of Grosse Isle since that time reveals the encouraging fact that there have been no serious epidemics of any of the major quarantinable diseases—smallpox, typhus, cholera, plague or yellow fever. So far as the present-day situation is concerned, modern sanitary conditions throughout the civilized world, coupled with the careful check on all ocean passengers prior to embarkation, particularly of those from infected areas, and efficient medical

MONUMENT ERECTED BY THE ANCIENT ORDER OF HIBERNIANS IN MEMORY OF THE VICTIMS OF TYPHUS FEVER WHO DIED AT GROSSE ISLE IN 1847

services on board the ocean liners, including the immediate isolation of infected cases, reduce to a minimum the possibility of a recurrence of virulent outbreaks of quarantinable diseases at Canadian ports of entry.

The Quarantine Regulations have been amended from time to time in order to bring them into harmony with modern international quarantine requirements. The present edition of the Quarantine Regulations was approved by the Privy Council in December, 1928.

POWER PLANT AND WHARF WHERE QUARANTINABLE CASES ARE LANDED AT GROSSE ISLE

The Grosse Isle Quarantine Station comprises the central or administrative division, the hospital or sick division, and the detention or observation division for the accommodation of contacts. The hospital division has available about 130 beds, and the detention division a total of 1,082. Should a further demand upon accommodation be made at any time, a number of hospital tents are available. The wide separation of the hospital division from the observation division was planned in the days when it was believed that disease germs could be transmitted by air. This theory has long since been disproved. As soon as means are available, it is the intention of the Quarantine Division of the Department of National Health to transfer the hospital division to a site immediately adjacent to the present detention quarters, thus centralizing the service in an area less than a quarter of that it now occupies.

Up to the year 1924 the Grosse Isle Quarantine Station was used as a detention quarters for both major quarantinable and minor infectious diseases. In that year, however, the obsolete policy of quarantining such diseases on the island as measles, scarlet fever, diphtheria, chickenpox. etc., was abandoned, and such cases transferred to the infectious diseases unit of the Immigration Hospital at Quebec. This procedure is in harmony with modern practice in all other countries of the world and has proved eminently satisfactory. The Grosse Isle Quarantine Station, including a power and disinfecting plant, a well equipped laboratory, etc., is, however, held in readiness at all times during the season of navigation on the St. Lawrence river to cope with any possible outbreak of the major quarantinable diseases.

Another important change which has been effected in recent years is the transfer of the quarantine inspection base from Grosse Isle to Father Point, some 200 miles below Quebec, where the medical quarantine officer goes on board at the same time as the pilot. This facilitates shipping by doing away with the necessity of a stop-over at Grosse Isle except in the event of having major quarantinable disease on board. In such an emergency the Medical Officer in Charge at Father Point wires the necessary instructions to the Immigration Medical Officer in Charge at Quebec to mobilize to Grosse Isle what personnel may be necessary to cope with the situation.

Since 1920 the only quarantines that have taken place at Grosse Isle Station are as follows: In 1922, one case of smallpox and two smallpox contacts; in 1926, one case of smallpox and forty-five smallpox contacts; in 1927, one case of smallpox with seven smallpox contacts, one case of typhus fever and one typhus fever contact.

Public Health Service---A Sound Investment

I estimate that the expectation of life can be increased by more than 5 years provided the knowledge now available be utilized by health organizations, public and private. The expectation of life in the country as a whole can be extended to a span of at least 65 years. This is not an idle dream for it has virtually been done in far-away New Zealand. Progress will go considerably beyond this point; exactly how far will depend upon new discoveries in preventive medicine in our laboratories and clinics.—*Louis I. Dublin, Ph.D., F.A.P.H.A., Am. J. Pub. Health, v. XXI, No.* 5 (*May*), 1931.

BCG Vaccine

ALLAN C. RANKIN

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I SUPPOSE a consideration of the extent to which this vaccine has been used as a prophylactic against tuberculosis in the new-born in Canada, by J. Baudouin and his collaborators of the Université de Montréal, on the continent and elsewhere by many observers—and thus of the importance which it has assumed in the world—will exonerate me from any serious criticism in introducing such a contentious subject to this association.

As, also, we have been investigating and experimenting with this vaccine in Alberta for the past six years*, I am able, in many respects, to speak of it from personal experience and may, therefore, escape the possible implication of excessive presumption. In fact, I do not think I could have been prevailed upon to speak of it from any other than such a relatively safe position—so acute has been the controversy.

Our group in Alberta, which has been able to carry on only through the generous assistance of the National Research Council and in connection with the Associate Committee of Tuberculous Research of that body, is composed of local men selected on the basis of special qualification for group research, and, as what I have to say is largely based upon the combined efforts of this group, I shall name them in order that their part in the work may be thus acknowledged and also that I may, in this sad world of doubt, acquire the comfort of their support:—

DR. A. H. BAKER—Superintendent Provincial Sanatorium, Alberta.
DR. M. R. BOW—Deputy Minister of Health, Alberta.
DR. D. L. MCCULLOUGH—Pathologist, Provincial Mental Hospital.
DR. J. J. OWER—Professor of Pathology, University of Alberta.
DR. P. C. TALBOT—Provincial Veterinarian—Professor of Veterinary Science, University of Alberta.
PROF. J. P. SACKVILLE—Professor of Animal Husbandry, University of Alberta.
DR. R. M. SHAW—Professor of Bacteriology and Hygiene, University of Alberta.
DR. H. M. VANGO—Asst. Professor of Pathology, University of Alberta.

It is not necessary nowadays, I presume, for me to do more than to point out, shortly, for the purposes of making a beginning and in order that we may refresh our memories, that BCG is an attenuated strain of *Mycobacterium tuberculosis* (*Bovis*), derived from milk, and held to have become non-virulent and non-tuberculogenic by reason of a long sojourn on a 5 per cent glycerinated potato medium containing

*The Alberta Committee of Tuberculosis Research, formed in 1924, at the instigation of the present Minister of Health for the purpose of the investigation of B.C.G., etc.

ox bile, under the manipulation of Calmette & Guerin over a considerable number of years (230 sub-cultures), and that we know it under the appellation, Bacillus Calmette-Guerin.[2]

It can be used for the production of Old Tuberculin and will render, at some time or another, an animal sensitive to the standard tuberculin tests, indicating a biological relationship between the tissues and the organism. As a vaccine, it is used alive, of growth of not more than 28 days (usually 21 days) from glycerinated potato or Sauton's synthetic broth, suspended in fluid and used only for ten days subsequent to preparation. Its efficiency depends upon its viability, as dead organisms give comparatively very little resistance. This, however, only confirms a well known fact in immunity when it can be shown experimentally that greater resistance can be obtained with the use of viable viruses, than with dead, and exemplified in our every day experience with naturally acquired immunity as a result of an attack of disease, in contrast to artificially produced immunity with killed organisms, *e.g.*, typhoid fever. As there is, however, some difference of opinion on this point, with special reference to tuberculosis, I give my own view which is very comfortably founded on common experimental and natural evidence, although some resistance in experimental animals has been produced with vaccines of dead tubercle bacilli.[8] The question is interesting, and it is to be hoped a common belief upon a firm basis of fact can soon be established.

The three great questions respecting BCG upon the answer to which depends an unanimity of opinion regarding its possible uses are:

1. Will the organism revert to virulence in culture and in the tissues?
2. Does the vaccine produce a resistance of sufficiently high grade to be of use in the control of tuberculosis, and, incidentally, how long will this resistance be effective?
3. Will BCG vaccine tend to the production of carriers?

When we consider that there is good evidence to show that in urban districts a very high percentage, 40 to 90 per cent of children over fifteen years of age, show past or present evidence of tuberculosis,[8] there perhaps almost seems, under the circumstances, unnecessary caution in the opposition given to BCG on the ground that it may constitute a possible agent of tuberculous infection.

Relative non-virulence is a fundamental requirement in a vaccine, and, of course, must be definitely established before the vaccine can be used. In dealing with the tubercle bacillus, however, there are difficulties not encountered with other vaccines—the most important of which, probably, is the persistence of the organism in the tissues. Of the others, that causing most conjecture is the manner of the excretion of the bacillus through the mammary glands in animals with progressive lesions—does this always depend upon a local lesion or can the organism be excreted in the milk without, at least, a local minute lesion in the udder?

The question of the virulence of this organism is still confused. Originally Calmette held that it was non-virulent and non-tuberculogenic for man and experimental animals, and, during the earlier years following its introduction this belief was not questioned. E. A. Watson,[13] of Ottawa, was one of the first to question this non-virulence and finally published that he had been able to produce lesions in guinea pigs. No statement was made at the time as to the method of cultivation, a rather unfortunate omission, as it led to unnecessary controversy, for many observers were growing the organism according to Calmette's method, and could not demonstrate virulence. Opinion has recently been expressed that it is virulent on primary inoculation for guinea pigs, even when carried according to Calmette's methods and irrespective of the size of dosage. The first statement was confirmed concurrently [5, 6, 8, 9, 12] by several other investigators, but there is still confusion owing to the uncertainty of the methods, cultural and otherwise, employed.

The publication of the work of Petroff, Branch & Steenken,[9] Petroff and Branch,[8] Petroff,[7] respecting the dissociation of this organism into R & S colonies had a profound effect upon the thoughts and opinions of those interested in the subject, and, subsequently, G. B. Reed of Queen's University, Kingston, was able, by using similar methods, to confirm these findings with various cultures of the organism obtained from different sources, including the strain we have been carrying in Alberta for the past six years. A culture direct from the Pasteur Institute, however, which Reed has had in his laboratory for over two years has, so far, been resistant to the methods employed. There are indications, that, as directed, the culture should be frequently returned to bile-media for a short time, as a precautionary measure. The S colonies so separated have been stated to have considerable virulence for guinea pigs. This dissociation may occur under favourable conditions with either an R or S strain, so that we may have S reverting to R, or R reverting to S.[1] Sasano and Medlar[11] taking the whole culture, without attempting dissociation in the manner employed by Petroff and his associates, have rendered it virulent for guinea pigs by growing on a serum medium of a certain reaction. This, of course, may mean dissociation and probably explains some of the results obtained by various workers who did not maintain the organism on bile potato media, etc. Here we have, what might seem, a very unfavourable condition of affairs, which is made the most of by those opposed to the method. If, however, we go into the matter more thoroughly we can bring out important favourable features.

We do not know of any published work, proving that BCG grown according to Calmette's method, will dissociate or cause progressive lesions on primary inoculation in the natural host (Bovines). In the article quoted above, Sasano and Medlar found it non-virulent, in doses of 20 mg., for guinea pigs when so grown, and with the exception

of the Lübeck disaster, although hundreds of thousands of infants have been vaccinated, there has, at least, been no increase in deaths from tuberculosis amongst the vaccinated. Indeed, the general death rate is lower. In Lübeck, as you probably all know, a virulent human strain of the tubercle bacillus, corresponding to one of the laboratory cultures, was isolated, *post mortem*, from one of the children, and also a human strain was isolated from some of the vaccine.[3]

In Alberta we have conducted experiments, the results of which, we think, constitute valuable evidence in favour of the non-virulence of this organism for bovines, the natural host, when grown and given according to Calmette's methods. These experiments, some of which have been published, involve forty-two vaccinated animals.[10] In the first experiment, ten 2-year-olds, free from tuberculosis as shown by the tuberculin test, were vaccinated in the dewlap with 60 mg. of culture given according to Calmette's method, and protected from possible outside sources of tuberculous infection. On April 26th, 1926, seven months later, these animals were slaughtered and did not show evidence of tuberculosis, macroscopic or microscopic, nor later following guinea pig inoculation of glandular tissues.

Subsequently, in 1927, ten new-born calves vaccinated and held for a period of one year failed to show macroscopic or microscopic evidence of tuberculosis, and sixty-three guinea pigs inoculated with macerated glandular material, and held for periods varying from three to four months, were free macroscopically and microscopically from tuberculosis. Further, seventeen new-born calves vaccinated by mouth in 1928, with three doses of 50 mg. of a similar vaccine, were, by all methods of examination, after a period of two years, free from tuberculosis, as were also sixteen unvaccinated controls kept for a similar period under similar conditions. We consider these experiments to have been well carried out and the results reliable.

Finally, the macerated tissue from the vaccination lesions, cut out during life or after slaughter, from five experimental animals, which had not been exposed to infection from other source, and in which tubercle bacilli could be demonstrated microscopically, did not produce lesions in fourteen guinea pigs in periods ranging from two to four months.

If we, in Alberta, have any faith in our methods of experimentation, we cannot but conclude, as we do, and consequently take our stand with those who do not consider there is evidence proving that the organism, grown according to Calmette's methods and used as it is recommended for vaccination, subcutaneous, or by mouth, in the natural host, will dissociate or produce progressive lesions. This being so, it is perhaps quite reasonable to assume, on the experimental evidence and the statistics available, that it is non-virulent for the other species of animals, including man, which are not commonly so susceptible to bovine infection.

And now we come to the consideration of the second important controversial feature, which deals with the degree of resistance produced by the vaccine in vaccinated animals. Here, it will be advisable also to confine ourselves to experimental results, and not indulge overly in conjecture as to what might or might not occur. Practically all workers agree that the vaccine, after a period of time, will produce a relative resistance which lasts for some months; but the important points are—whether or not the resistance so produced is sufficient for prophylactic purposes, and, further, what is the duration of time during which it is maintained. As has already been stated by others, a little resistance may be of great importance in the fight against tuberculosis, so that it behoves us to consider well any possible agent capable of assisting in the control of the spread of the disease.

In the experiments on animals varying results have been obtained by different observers, so that there are those who maintain that the vaccine produces only a transitory inadequate resistance of no value in the control of the disease, while others consider the experimental results as very encouraging and hold that satisfactory resistance is produced.

It must be admitted that it is somewhat difficult to accept, with confidence, all the divergent experimental results. An approximately satisfactory explanation can only be made on the basis of experimental methods employed, which, introducing different procedures in such matters as the cultural methods followed, the manner of preparing the vaccine, the age of the vaccine, the method of vaccination and the source, protection, housing, feeding, etc. of the experimental animals, together with the important question of time, cannot but have been productive of varying results—to say nothing of the interpretation which may have been put forward as a result of individual opinion and conjecture.

Our experience in Alberta, over a period of six years, has indicated quite definitely the great care required in carrying out experiments of this nature, where one is dealing with large animals. Time does not permit of more definite reference to the results of other workers. As far as we are concerned, we want to go on record as being amongst those who hold that BCG vaccine produces resistance in vaccinated animals (bovines) and that, therefore, it may be shown, under certain circumstances, as time goes on, an important agent in control of tuberculosis. Indeed, we are further of the opinion that there is statistical evidence already available indicating its value as a prophylactic vaccine in new-born children. Time will tell—but, as it is of importance for the profession to protect the public from methods of incompletely established prophylaxis or treatment, so also is it of equal importance to restrain from criticism pending an analysis of the available facts as they bear, one upon the other, of a method which

may prove of value, nay, is probably even now proving of value in the control of tuberculous infection in humans in certain circumstances.

Time may be taken to quote the following experiments, conducted by the Alberta Committee, in which every experimental factor was under control, and which, therefore, may be considered as good experimental evidence bearing on the above remarks.

In 1928, forty-eight new-born calves, twenty-five of which were vaccinated in the dewlap with 60 mgms. of BCG prepared and given in accordance with the methods of Calmette, and suitably fed and housed, were, after a period of nine months, given an intravenous injection of 5 mgms. moist weight of a virulent bovine strain of tubercle bacillus (Vallée). In all cases, this dosage of virulent bacilli was given at least nine months subsequent to vaccination, as regards the vaccinated animals, and in most cases well over ten months after vaccination. Within sixty days, subsequently, six of the twenty-three non-vaccinated controls were dead of generalized tuberculosis and two months later, all the remaining control animals, with one exception showed at autopsy progressive caseous lesions.[10, 2] That is to say, 95 per cent of the unprotected controls were tuberculous, while, of the vaccinated animals, 80 per cent were macroscopically free from lesions, and, with the exception of one animal which died of tuberculosis, all could have passed for food, as the macroscopic lesions were calcareous and of slight extent. Nineteen of these vaccinated animals, however, subsequently showed microscopic glandular lesions of small extent. These findings, in the vaccinated animals, indicate retention by those animals of the virulent strain with the production of minute microscopic lesions, but demonstrate marked resistance as contrasted with the more extensive caseous lesions in the control animals thirteen to fourteen months after vaccination. And, in a similar experiment carried out in 1926, with ten animals, similar results were obtained seven months after inoculation, and eleven months after vaccination. Here, sixty-three guinea pigs inoculated, at slaughter, with macerated glandular material from the vaccinated animals, seven months after inoculation, developed tuberculous lesions, with one exception, even in the absence of microscopic lesions.[10]

Finally, there is the question of the carrier. Some critics, upon obscure grounds, have stated that vaccinated animals, and, therefore, by inference, vaccinated children may be carriers of virulent bacilli. Thus it has been stated, and our associate McCullough is quoted as an authority, that vaccinated cows will excrete virulent tubercle bacilli in the milk; without a very proper and necessary qualification of the statement, namely that the animals in question had been in contact with tuberculous animals from birth, and that vaccination had lapsed for a period of considerably over twelve months. The implied inference, which might be taken under the circumstances, is that BCG had become virulent in the tissue, and was being excreted in the milk as a

virulent bacillus. Now, I think, it can be safely stated that there is not one bit of experimental evidence proving this.

By the term "Carrier," as we understand it, is meant an individual who is excreting a virulent organism, subsequent to a typical infection from it, as for instance, a convalescent temporary carrier, or a permanent or chronic carrier, following an attack of typhoid fever. There are also the chronic carrier and the temporary carrier who have never shown clinical signs of infection, or in whom the symptoms of disease were so slight as to have been overlooked, as in cholera and typhoid.

The vaccination of cattle with a human strain, according to von Behring's method was condemned on the ground of the excretion of human bacilli in the milk. There we were dealing with a virulent disease producing organism, at any rate, as regards humans. When we come to BCG, however, the application of the term "Carrier" needs qualification in order that there may be no misconception. While it cannot but be admitted that vaccinated animals may pick up and so excrete virulent tubercle bacilli, the same applies to unprotected animals, the only difference being that the vaccinated animals are apparently not so liable to develop active tuberculous lesions, and the tuberculin reaction is not available for diagnostic purposes. I wish to make distinction on these grounds and to point out that, as far as BCG is concerned, the true "carrier" problem, where vaccination has been carried out according to Calmette's methods, must be intimately associated with the possibilities of dissociation, or the return to virulence of BCG in the tissues, and is not a matter of the transportation, so to speak, of virulent tubercle bacilli from natural or other source in vaccinated animals any more than such might be the case in naturally infected non-vaccinated animals. There is, however, the possibility of dissociation taking place from enormous doses, which may be the reason of an occasional unexplained infection in guinea pigs. In a recent article[4] Gilbert, from the Department of Pathology and Bacteriology of Johns Hopkins Medical School, has reported, under certain circumstances, the dissociation of an R type staphylococcus in guinea pigs in enormous doses, that is 8-10 cc. of a 24 hour broth culture. If the animal lives 48 hours a virulent capsulated S type staphylococcus can be recovered, not demonstrable if death occurs under 24 hours. Five cc. of the same broth culture of R type staphylococcus is non-virulent for the guinea pig; while 0.025 cc. of a 24 hour broth culture of the capsulated S type staphylococcus is fatal, intraperitoneally. Some of the divergent results obtained with BCG may be possibly explained on somewhat similar grounds, even aside from the question of dissociation, quite in conformity with our previous knowledge of infection where a relationship between dosage and invasion is generally acknowledged.

The amount of BCG culture used experimentally in the guinea pig has been relatively enormous to that which is employed for prophylactic

purposes in bovines and humans, and should be quite outside such an experimentally demonstrated possible hazard.

In one of our last unpublished experiments we kept sixteen non-tuberculous controls in close contact, as to quarters, food, water, etc., with seventeen mouth-vaccinated non-tuberculous animals for a period of two years without the development (as shown *post mortem* by all methods of examination including guinea pig inoculation of macerated glandular tissues) of tuberculosis in any form. These unprotected animals, although in close contact from birth with mouth-vaccinated animals, eating and drinking from the same trough, were apparently at no hazard by the association with vaccinated animals.

Let me say in conclusion that, in this short paper, I have endeavoured to point out only some of the evidence, including our own, which should have a bearing upon our interpretation of the present status of BCG vaccine as a prophylactic in tuberculosis. I hope my hearers will consider the continued maintenance of the position, which we have always held, in so far as we are capable of judging the accumulated experimental evidence, etc., as reasonable and without prejudice.

It is evident that BCG vaccine is generally of more importance to-day than at any other time previously, and that in the face of very serious and, to our minds, not always unbiased criticism. Some of the questions have not yet reached the position where the uninformed can be assured of a reasonably accurate judgment on the part of the profession as expressed by those capable of forming an opinion.

REFERENCES

[1]Begbie, R. S., 1931, Edinburgh M. J., v. 38, p. 174.
[2]Calmette, A. and Guerin, C., 1926, Ann. Inst. Pasteur, v. XL, p. 89.
[3]German Federal Bureau of Health, Berlin letter, 1931, J.A.M.A., v. 96, p. 283 and p. 372.
[4]Gilbert, I., 1931, J. Bact., v. XXI, p. 157.
[5]Nobel, E., 1928, Wien. klin. Wchnschr., v. 41, p. 798.
[6]Nobel, E., 1928, Wien. klin. Wchnschr., v. 41, p. 87.
[7]Petroff, S. A., 1928, Wien. Med. Wchnschr., v. 78, p. 1433.
[8]Petroff, S. A. and Branch, A., 1928, Am. J. Pub. Health, v. 18, p. 843.
[9]Petroff, S. A., Branch, A. and Steenken, Wm. Jr., 1927, Proc. Soc. Exper. Biol. & Med., v. 25, p. 14.
[10]Rankin, A. C. and Members of Alberta Committee, 1929, Canad. J. Research, v. I, p. 48.
[11]Sasano, K. T. and Medlar, E. M., 1931, Tubercle, v. 12, p. 214.
[12]Selter, H. and Blumenberg, 1927, Wien. klin. Wchnschr., v. 6, p. 1134.
[13]Watson, E. A., McIntosh, C. W. and Koust, 1928, J. Am. Vet. Assoc., v. 73, p. 793.

Refrigeration and its Health Aspect

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THE problem of preserving food collected during times of plenty for use when the source of supply fails, has been practised by man from the remotest ages. Among primitive races, food preservation was essential to avoid famine. In modern civilized countries, the preservation of food is an important factor in maintaining a balance between the demand and supply of perishable foods.

Chemical processes of animal and vegetable tissue continue active in these foods even after evidences of life have gone. Fruits ripen, grains mature, starches become sugars, flavours develop, and meat becomes tender. There are numerous methods employed to restrain the activity of these processes in foods. The most important is by refrigeration or cooling. Other methods are by drying, dehydrating smoking, pickling, curing, preserving and cooking.

Refrigeration is the method of food preservation which causes a minimum of alteration of the desirable food properties. The natural freshness and flavours are retained without abstracting moisture, and there is a minimum change in the physical, chemical, or nutritive qualities of the food.

The recent development of refrigeration for the preservation of food is simply the latest step in the long line of advance by which European races in particular have rendered their food supplies more varied and more secure. Refrigeration has also been recently applied to the preservation of perishable foods. In tropical countries it has proved, in fact, to be one of the means that modern science has employed in rendering the tropical regions habitable for white people. With its aid many of the foods to which they are accustomed in their temperate homes can be properly preserved and consumed without the risk of disease infection which was common before its introduction.

In the preparation of many perishable food products there is a tendency to use refrigeration either during the manufacturing process or after the goods leave the plants, and so to reduce the demands upon salting, drying, heating, etc., as safeguards against deterioration. Thus it has found its way into margarine works, into butter and cheese and sausage factories and into plants for conditioning of milk prior to transit.

Although commercial refrigeration processes date back only fifty years, they have attained, with the rapidly diminishing capacity of the regions along both sides of the North Atlantic seaboard to provision themselves from their immediate hinterlands, not only a thoroughly established position, but also, what is perhaps not so patent, the power to modify and control large movements in international trade, and even the distribution of populations and the destinies of nations. Refrigerated transportation and cold storage comprise one of the several

agents that have contributed, and are still contributing to the growth of compact areas of dense population, in particular of great cities with their peripheral areas, such as London, New York and Chicago.

From an economic point of view the great service rendered by refrigeration is that it enables vast quantities of field-grown perishable food-stuffs produced in the Southern Hemisphere and in the continental interiors in the Northern Hemisphere to be made available in populous areas where otherwise vast expenditures would be necessary to furnish the same foods. The time is past when people in civilized and accessible places have to use salted meat, salted fish and salted butter in the winter.

Refrigeration quietly brings about improvements in the standard of living for large populations, of a kind not easily revealed by index numbers.

To preserve food, relatively low temperatures must be maintained. Temperature control alone is not enough, however, for successful food preservation. The condition of the atmosphere, in which the food is kept, must be closely controlled if the best results are to be obtained. Successful food preservation requires low temperature, correct humidity, proper atmosphere, controlled odours and, of course, sound and suitable foodstuffs for storage.

The low temperatures required vary greatly with the foodstuffs to be preserved. In any one class even, considerable variation in requirements is necessary. For instance, the desirable temperature for apples and grapes is lower than that of lemons and grapefruit. In general, the fruits high in sugar content are preserved better at lower temperatures than are suitable for sour or more acid fruits.

Dairy products present a special problem in refrigeration, as all of them take on foreign odours readily. Thus it is desirable to store these products in isolated quarters away from other storage divisions. The nature of milk makes it imperative that the refrigerator itself be constructed of positively odourless materials, and that no material of appreciable odour be carried or kept in the same room.

Of all the foodstuffs kept from spoiling by means of ice, none is of such importance as milk. Neither is there any food which depends to such an extent upon adequate cooling to maintain its purity. Bacteria will multiply in milk as long as it is not frozen solid. Milk of good quality will stay sweet and in perfect condition for more than a week if it is held at a temperature slightly above the freezing point.

The storage of eggs is a great economic problem in both America and Europe. The nature of hens cannot be greatly changed; consequently, storage of sufficient eggs in the early summer season to last over until the following spring has become an economic necessity. The problem in vegetable storage is the prevention of withering or what may be more commonly called evaporation. From the standpoint of preservation, fish, probably, offers one of the greatest refrigeration problems. Considerable success has been had in keeping some kinds of fish by freezing them in small pans; that is, making up cakes of ice

with the fish frozen solidly in the cakes. These cakes are then staked in the cold rooms for periods of several months. Meats are relatively easy to preserve as the nature and mass of the product makes the refrigeration process relatively simple.

Salt and the so-called chemical preservatives such as borax and formaldehyde have been retired to the background with the development of refrigeration. Generally speaking, only the choicer and more distinctly seasonal kinds of produce will bear the cost of canning; bulk commodities must be refrigerated, if anything more than a few days is to elapse between production and consumption. The addition of chemical preservatives to perishable foodstuffs to supplement refrigeration and in some directions to supplant it, has been ruled out in most countries, and the weight of opinion against their use seems to be too great to warrant their being re-introduced.

Refrigeration as a method of food preservation has been one of the industrial successes of the age. The number of products commercially handled under refrigeration is constantly increasing, and practically all the possible means by which cold can be applied have been investigated. Refrigeration consists largely in the exchange of heat. Primarily, what is required is the production of a lower temperature. The process of refrigeration is the removal of heat or the production of cold.

A large number of refrigerating media are available. The principal potential refrigerants are: ammonia, NH_3; carbon dioxide, CO_2; sulphur dioxide, SO_2; ethyl chloride C_2H_2Cl; methyl chloride CH_3Cl; butane, C_4H_{10}; propane, C_3H_3; ethane, C_2H_6; isobutane, C_4H_{10}; nitrous oxide, N_20; ether, $(C_2H_5)_20$; carbon bisulphide, CS_2; chloroform, $CHCl_3$; carbon tetrachloride, CCl_4; dieline, C_2H_2Cl; trieline, C_2HCl.

Of the above, the non-inflammable refrigerants are carbon dioxide, sulphur dioxide, carbon tetrachloride and nitrous oxide.

The other refrigerants mentioned are inflammable to some degree. Methyl chloride burns with difficulty. Ethyl chloride is about as inflammable as alcohol. Ammonia burns in air with difficulty when cold, but ignites much more readily when heated. It may, however, break down into its constituent elements, giving the gas an excess of hydrogen. In this condition it is highly dangerous, as hydrozen has a great affinity for oxygen, and at the correct temperature will explode violently.

Only a relatively few cases are on record where explosions have occurred directly from the heat of the operation. More often the explosion occurs from prohibitive pressures caused by closed discharge valves, failure of condenser supply water, or similar cause. The hazard of an explosion in buildings containing the explosive refrigerating supply receivers and tanks, if the building catches fire, is the great risk.

A recent case is on record where a fire originated near a sulphur dioxide machine, causing a bursting of the receiver tank by the great pressure of overheated sulphur dioxide. The sulphur dioxide fumes smothered the flames sufficiently to enable the fire department to save most of the property.

Ammonia has most of the desired characteristics of a commercial refrigerant, *i.e.*, low boiling point, very high latent heat of vaporization, leaks can be readily detected by its odour, it can be readily obtained in large quantities, and compression pressures required are sufficiently low to not cause serious compressor construction difficulties.

Carbon dioxide refrigeration owes its development largely to marine practice. Until fairly recent times, its use was confined largely to this service, and to special low temperature work in chemical processes. To-day it seems to be finding a place in various new channels. Carbon dioxide is practically colourless, odourless, and non-inflammable. Its high specific gravity has an advantage in that it makes possible a smaller compressor cylinder displacement than would be required for the lighter vapours, and in part, compensates for its low latent heat in the refrigerating process.

Solid carbon dioxide, more commonly referred to as dry ice, has been favourably accepted for refrigeration of small packages in transportation. For such a service it is well adapted. At present it appears as though the field of dry ice is that of supplementing the water ice industry by making available a convenient form of highly efficient refrigerating solid that is very compact and that leaves no slop or wet package. Historically, CO_2 sticks were used in small quantities by English officers in India as early as 1898 to make iced drinks available in the more remote sections.

Sulphur dioxide is a relatively harmless gas. It will produce some throat irritation if breathed freely, and when mixed with water, the solution will produce an itching on parts of the human body that are bathed in it. From the operation standpoint, probably the item of comparison that is of exceptional interest is that of the suction pressures. Under standard ton conditions ammonia requires a gage pressure of 19.6 pounds. For the corresponding operation of the carbon dioxide machine it requires a suction pressure of 319.7 pounds. With sulphur dioxide the pressure required is 11.8 pounds. Sulphur dioxide has found its greatest application in the household machine.

Methyl chloride is a compound nearly as free from poisonous characteristics as carbon dioxide and has found considerable use in high temperature work in small machines. The principal physical effect that the human being will experience under the influence of methyl chloride is its reaction as an anaesthetic. The flash point of the liquid is very low, and it will only explode when the methyl chloride is less than 15.5 per cent and above 3.6 per cent of the quantity of air present. This condition is unusual so that methyl chloride has been considered a safe refrigerant.

Ethyl chloride, like methyl chloride, is used only in small plants. Ethyl chloride is usually considered somewhat more explosive than methyl chloride. Its flash point is considerably lower, and it burns with somewhat greater violence.

Butane, *propane* and *ethane* belong to the methane series of the

hydrocarbon gases. All hydrocarbon gases with the proper mixture of air will ignite explosively if the temperature of the mixture is raised beyond the ignition point, and due care should be exerted to prevent both the formation of the mixture and the raising of the temperature to a dangerous point.

An examination of the several properties of the four hydrocarbon gases referred to reveals that ethane is adaptable to the same field as carbon dioxide, propane to the same field as ammonia, and isobutane to the same field as sulphur dioxide. Of these four refrigerants, propane and isobutane have the greatest possibilities. In operating any of these hydrocarbon gases, they should be odorized with some strong odorant such as oil of spearmint or amyl acetate to ensure the quick detection of leaks.

Absorption System of Producing Refrigeration

New interest has developed in special applications of the absorption system of producing refrigeration. While the larger commercial ice and cold storage plants have passed almost entirely into the list of compression plants, there is a growing demand for absorption units for transportation and domestic use for the refrigerating of relatively small volumes.

Silica gel has the same chemical formula as pure silica sand. It is made by chemical treatment of sodium silicate.

The fields in which silica gel seems to give most promise are:

(1) The cooling of refrigerator cars.

(2) The refrigerating of rural homes and dairies.

This refrigerant requires no moving parts. It operates entirely from gas pressures produced within the unit itself. The inventors of this absorption cycle have effectively used Dalton's law of gas pressures. Dalton's law states that "a mixture of gases having no chemical reaction on each other exerts, at any given temperature, a total pressure which is equal to the sum of the partial pressures which would be produced by each gas separately if it alone occupied the containing vessel at the given temperature."

The gas that is used in the cycle as the refrigerant is ammonia in solution with water. A part of the absorber and of the evaporator is filled with hydrogen. Hydrogen forms a mechanical mixture with ammonia without any definite chemical reaction. As the limitations of this paper will not permit of further details, anyone interested is cordially invited to write to the author of this paper for a list of suitable references to the literature of this subject.

Household Refrigeration

There are certain essentials in household refrigeration which should be considered on account of their economics or health-protective features. First, it is necessary that the cabinet or refrigerated space in which the refrigerant is carried be properly insulated from the

surrounding atmosphere. For this purpose it is necessary that the cabinet be tight and that the walls be constructed, or at least largely constructed, of some material which is a poor conductor of heat. Examples of such material are cork, bakelite, wool, felt and sawdust. Another essential is that the refrigerated space shall be kept clean and free from anything that may harbour bacteria, the growth of which may give rise to odours which in turn effect the taste of the food. Thirdly, no harmful effects should result from the refrigerant, either upon the food or by leakage into the rooms. If ice is used in domestic refrigerators, it should be pure. Nowadays much of the ice used is made artificially, and the danger of pollution has been reduced. In mechanical refrigeration the refrigerating system should be so constructed and maintained that the refrigerant gases cannot escape.

The refrigerants commonly used in domestic cooling are sulphur dioxide and methyl chloride. Other chemicals employed as refrigerants are ammonia, carbon dioxide, and ethyl chloride, each of which has certain advantages in its application. In general, it may be stated that all of the chemicals employed in mechanical refrigerators have poisonous properties, but some are much more poisonous than others. The least poisonous and, therefore, the least harmful of the chemicals ordinarily employed is carbon dioxide, but this substance is not generally used in domestic refrigerating plants for the reason that it requires high pressure to liquefy the gas after it has evaporated. Such high pressure, namely 700 to 900 pounds, introduces an element of danger which to quite an extent offsets the other advantages of carbon dioxide.

In view of the fact that the gases commonly used in *multiple* refrigerating systems are poisonous, it is necessary that leaks of the refrigerating gases be guarded against. Investigations made by the Department of Health of Chicago, during recent months disclosed 190 leaks; of these, 152 were in multiple systems and 38 in single units. Leaks were found of nearly all of the common gases used, sulphur dioxide being the most frequent, with 82 leaks; and methyl chloride the next, with 77.

As to the location of the leaks, it was found that 68 per cent occurred in and around the evaporator; 20 per cent in and around the compressor, while only 6 per cent were due to broken pipes. The investigations also disclosed that leaks, especially in multiple refrigerating systems, are much more common than is ordinarily supposed. It is necessary that leaks in refrigerating systems should be detected as early as possible, so that gas cannot escape in sufficient quantities to give rise to sickness or more serious consequences.

Of the gases most commonly used, sulphur dioxide is readily detected. It has a characteristic pungent odour and suffocating effect when breathed, giving rise to a choking sensation. With ammonia fumes sulphur dioxide forms ammonium sulphite which settles out in the air in the form of fine white particles, giving rise to a cloudy appearance where the two gases come together.

Tests for methyl chloride are somewhat more complicated. Whenever refrigerators are installed or placed in living quarters, they should be located in a room separate from the living and sleeping rooms. The greatest danger exists where the refrigerator is located in a small, so-called kitchenette apartment. It is in connection with this type of installation that all of the deaths occurred in Chicago. The safest type of refrigerating system for such an apartment is a unit which cannot leak or which cannot leak more than three pounds in eight hours. It is also a good plan to install refrigerators in close proximity to windows which can be opened.

Precautions should also be taken in the maintenance of systems. Amateurs should not attempt to repair leaks, because often in doing so they strip the threads of bolts holding the gasket on the evaporator and injure the flange joints, thus causing dangerous leaks.

It is needless to say that force should not be used in removing trays from the evaporators and that at no time should sharp instruments, such as ice-picks or knives, be used in attempting to remove frost from coils. The way to remove frost and to release frozen-in trays is by the use of hot water or to defrost the system in accordance with the instructions supplied with each type of installation.

The health hazards of mechanical refrigeration have begun to receive the attention which their importance warrants. Previously the fire and explosion hazards alone were considered. People have taken toxic gases into their homes without question because they have supposed that the manufacturers of the equipment would not knowingly expose the public to undue danger. Certain makers have chosen to use methyl chloride as a refrigerant because it was less toxic than other gases commonly used. The number of deaths alone does not give a true picture of the importance of the problem presented by defective mechanical refrigerating equipment. With regard to some of those who have been poisoned but did not die, there is some question whether they ever will be restored to complete health and usefulness. Therefore, leaks that menace health as well as larger leaks that cause death must be prevented.

Experience has shown that there are numerous conditions which contribute to leaks in refrigerating systems, such as: vibration and settling of buildings, shrinkage of timber and other construction materials, and expansion and contraction of rigidly anchored piping systems. In addition, there is trouble caused by inexperienced persons tampering with the systems.

Field methods that will detect very small quantities of gas around exposed apparatus and piping do not solve the problem of hidden leaks in the concealed or inaccessible points where pipes are frequently placed in the furred-in spaces in buildings.

The rapid expansion of the use of mechanical refrigeration has created a new and serious public health problem for the public health engineer to handle.

Editorials

PUBLIC HEALTH AND THE PHYSICIAN

FROM time to time, criticism is levelled at the general practitioner in medicine by the technical expert in public health, for his seeming indifference to our efforts in the field of prevention. One wonders to what extent, if any, such criticism is warranted, and if it is found to be justified at whose door should the responsibility for its existence be placed.

While it is recognized that the physician is primarily interested in the cure of disease, it has been presumed that he is equally interested in its prevention. Organized medicine has never officially made any pronouncement as to how far the physician shall be expected to go in the prevention of disease, nor has the teaching college adequately established in the mind of the embryo doctor, how intimate is the relationship existing between therapeusis and prophylaxis; yet the profession have permitted it to be accepted as fact that they are as ardent in their enthusiasm for prevention as they are for cure. If this is so, what an anomaly exists, the worker contentedly attempting to limit his sphere of usefulness. The fact remains that the majority of the medical profession to-day, are doing consciously or unwittingly just that thing, and doing it without protest. In view of the fact that they are doing it willingly, might they be forgiven if they fail to evince too much enthusiasm in their job. Should we not be grateful for their interest instead of reproachful for their lack of zeal?

The curative side of medicine is age old, it is the field that requires the maximum of physical effort and mental ingenuity of the physician. It is intriguing, specific and often dramatic. It is what the public demand of him, and are prepared to pay him for. Preventive medicine, on the other hand, is new, in a measure untried, and lacking often in public support.

The profession divides itself into two groups, one a minority group, the other a majority. The first is made up of those not subject to change, who view all things new with trepidation and distaste; and of those who, being merely desirous of making a living, are likely to prostitute their professional ability for temporary gain. These, either viewing the activities of the health authorities with indifference or defiance, belittle or combat its efforts. The larger group, however, being interested or willing to be interested in the prevention as well as

the cure of sickness, realize the desirability of all measures which are directed at the securing of optimal health for their patients, and once we can assure them of the merit of the specific procedure and demonstrate its technique, they are prepared to adopt it as their own.

Let us review our method of establishing the value of such measures. We first are reasonably convinced by laboratory experiment of its potentiality but we need to justify its clinical application. We are naturally hesitant about consulting the profession in advance of its value being unquestionably established. We therefore gather our experimental material where we can, and demonstrate its usefulness upon those not ordinarily seeking medical advice; our hopes are justified, we are satisfied of its value, but still reticent about proclaiming it, and seeking larger groups for demonstration, we use the only group easily controlled and in most need of preventive service, the children of school age. Our demonstration is complete, our inference is a certainty, with natural pride we laud our service to mankind, and then we, or do we, with a sense of superiority, criticize the physician for his failure to keep abreast of us, in these, our efforts?

During this period of demonstration, the average physician has heard only rumours of this new panacea; he has heard such rumours before in the fields of treatment, and they have been dissipated into thin air. At the end of the experimental period he is told of the merit of the new measure and urged to apply it to all his susceptible clients. Without condoning his failure to do this, one must remember that his opportunities for bringing in the families of those he serves, are limited. He is compelled to urge those who are presumably well, to come to his office to pay for a type of glorified-treatment-in-advance, in which they are, in the main not interested, and with which he has limited experience. Anything, the value of which can only be established in a year or a decade, is difficult to sell by the accomplished salesman, let alone by a mildly interested physician. It is imperative, however, if such preventive services as are available are to be extensively used, that the co-operation of the general practitioner be secured by the health authorities. It would seem that the first step in establishing this co-operation would be to demonstrate the fact that we are all members of the same professional body, interested in the same problems, and not a group set apart with other objectives.

On the other hand, might we ask that the medical practitioner be equally charitable in his opinion of the public health official. Let him remember that his efforts often receive sparing praise when successfully carried out, and usually unwarranted censure when they seemingly fail.

J. T. Phair

LABORATORY SECTION

G. B. REED, PH.D. AND A. L. MCNABB, D.V.Sc.

New Data on the Rickettsiae and Typhus

PROBABLY the most interesting and important event at the Boston Meeting of the American Bacteriological Society in December was a paper on Mexican Typhus by Zinsser and Castaneda of Harvard. This splendid piece of work appears to put on a firm basis the generally accepted etiology of the disease, to solve or confirm several important points, to open an approach to specific treatment and considerably extend our general knowledge of the Rickettsiae.

It may be recalled that in 1909[2], Ricketts found associated with Rocky Mountain spotted fever coccoid and bacillary bodies which he regarded as having etiological significance. Seven years later de Rocha-Lima[3] found in lice taken from typhus patients similar bodies for which he proposed the name Rickettsia prowazekii in honor of Ricketts and Prowazek, both of whom died of typhus while investigating the disease. Later in the same year Rickettsia bodies were found in lice from trench fever cases. In 1923 similar bodies were associated with Tsutsugamuchi fever in Japan and in 1926 with Heartwater of sheep in South Africa.

This makes, with Rickett's original form which was later studied in detail by Wolbach[4], five types associated with disease; some thirty-nine others have been described as occurring in insects and other arthropods.

There have been three main views advanced concerning the nature of these bodies. (1) By some workers the Rickettsiae are regarded as inanimate particles resulting possibly from the degeneration of tissue cells under the action of a specific virus. It has generally been found that they are difficult to recognize, but those who have had most experience in the examination, particularly of lice, maintain that they are definitely distinguishable from other granular material. (2) Others have maintained that they are merely the form of certain bacteria assumed in the body of lice. The apparent intent of this proposal is to reconcile the finding of Rickettsiae in lice from typhus patients and the supposed rôle of B. proteus X in the disease. (3) The view held by most competent workers is that the Rickettsiae are independent, self-propagating micro-organisms, capable in some instances of producing disease in man or other animals. This view is based largely on circumstantial evidence and it is in this connection that the work under review is most signficant.

In the case of typhus, de Rocha-Lima first demonstrated Rickettsia bodies in lice fed on active cases of the disease and their absence in lice fed on normal individuals or on typhus convalescents. At the time when the bodies become apparent in the lice, the lice are infectious for guinea

pigs. The study made by Wolbach, Todd and Palfrey in Poland in 1930, however, indicated that only about one-quarter of the lice fed on typhus patients become infectious for guinea pigs and about the same proportion develop the Rickettsia bodies. The parallelism appears to be significant. The Rickettsia bodies have also been demonstrated in human tissues particularly in vascular lesions of the skin and the brain.

There have been conflicting reports of the filterability of the typhus virus. Zinsser now reports that, using the new method of Wart and Tang, highly successful with filterable viruses, the typhus virus is not filterable. In infected guinea pigs he finds the virus in the blood plasma and in more concentrated form in scrapings from the tunica vaginalis. But of greater import is his discovery that the number of Rickettsia bodies in guinea pigs and rats can be increased by lowering the animal's resistance, before inoculation, by injections of benzol or by the feeding of a vitamin-free diet until they are in very poor condition. Such animals, he finds, invariably show the presence of Rickettsiae in increased numbers and a wider distribution in the tissues. In some animals, enormous numbers appear in the tunica vaginalis, the peritoneum and sometimes in the pleura. From such animals the macerated tunica material proved to be much more infectious than the blood plasm, apparently in proportion to the number of Rickettsiae present. Using tissues from heavily infected animals, he was able to wash the Rickettsiae free of tissue cells and to demonstrate their existence as independent bodies. A new and simple method of staining, consisting of flooding films with a dilute methylene blue in a pH 7.0 buffer mixture containing 5 per cent formalin, greatly facilitates and clarifies the demonstration. The washed bodies injected into guinea pigs produced the characteristic disease and such animals after recovery were shown to be immune to both European and Mexican strains of typhus.

Convalescent blood from typhus guinea pigs mixed in the test tube with the washed Rickettsia bodies renders the bodies non-infectious, provided the blood is taken between the first and the tenth day of defervescence. After the third week the blood no longer contains protective bodies though the pigs may still be immune.

Perhaps one of the most important features of the report is the finding that Rickettsia bodies, if collected in sufficiently concentrated form from these animals, killed with formalin and injected into normal animals, provides an active immunity sufficient for complete protection or, at least, a favourable modification of the disease.

This work then appears to have added a new method of obtaining increased numbers of Rickettsia bodies. It has demonstrated that the infectiousness of typhus guinea pig material depends upon the concentration of Rickettsia bodies. It has shown that the Rickettsiae are rendered non-infectious by contact with immune typhus serum, and, finally, it has shown that formalin-killed Rickettsia bodies induce a considerable degree of immun-

ity in normal animals. The improved staining technique, the very clear preparations free of all tissue cells, combined with lack of filterability, seems to add evidence that the Rickettsiae are more like true bacteria than any other known form.

References—

[1]Abstract. Am. Jour. Bact. V. P., 1931.
[2]Jour. Am. Med. Assoc., V. LII. p. 379, 1909.
[3]Berl. Klin. Wch., V. LIII, p. 567, 1916. p. 723, 1925.
[4]Jour. Am. Med. Assoc., V. LXXXIV,

G. B. Reed, Ph.D.

NATIONAL VOLUNTARY HEALTH AGENCIES

MISS ETHEL GREENWOOD Reg.N.

THE ANNUAL MEETING OF THE VICTORIAN ORDER OF NURSES

THE thirty-third Annual Meeting of the Board of Governors of the Victorian Order of Nurses for Canada, held in Ottawa on May 20th and 21st, was in many senses one of the most interesting ever held by that organization. Forty-six of the Order's 82 centres were represented and there was a large attendance at all sessions.

The morning of the first day, May 20th, was occupied by a Joint Session of the Advisory Nursing and Education Committees with the Nurses' Conference (which had met the two days previous to the Annual Meeting), Mrs. R. W. Reford of Montreal presiding.

At a luncheon for the delegates given by the President, the Right Honourable George P. Graham, and Mrs. Graham, the speaker was the Honourable Murray MacLaren, Minister of Pensions and National Health.

At the afternoon session, following the President's welcome to the delegates, reports and election of officers, an excellent address was delivered by Miss Mary Beard, Associate Director, International Health Division, Rockefeller Foundation, on the subject, "Public Responsibility for Public Health Nursing".

A unique feature of this year's meeting was the collection of exhibits assembled in response to a competition sponsored by the Education Committee of the Order. Twenty-six districts sent in exhibits, and on behalf of Her Excellency, the Countess of Bessborough, Honorary President of the Order, the awards were presented by Lady Clark at the afternoon meeting on May 20th. In the 1-2 Nurse District Group, first prize was won by Sarnia; Brockville came second, and Truro and Kingston received Honourable Mention. In the 3-10 Nurse District Group, Hamilton won first prize, Burnaby, second, with Honourable Mention being secured by Victoria, Edmonton and Glacé Bay. Honourable Mention with distinction was awarded to Sherbrooke.

In the 11-25 Nurse District Group the one and only prize was awarded to Halifax. In this group Winnipeg was recommended for a special award. In the Over 25 Nurse District Group, Toronto received the prize.

The report of the Chief Superintendent, Miss Elizabeth Smellie, was replete with interest, and pictured graphically the growth and progress of the work throughout Canada in 1930. Eight new centres were opened during the year. Eight scholarships were awarded by the National Board. The Order's maternal mortality rate shows progressive decline:—1927, 2.5; 1928, 1.6; 1929, 1.7; 1930, 1.2.

On the evening of the first day Dr. A. Grant Fleming delivered a thoughtful and inspiring address on the subject of "Relationships".

Thursday morning was taken up with a Round Table Conference for Board Members. At luncheon the speaker was Dr. A. Grant Fleming who addressed the gathering on "Sidelights on the Survey", being a résumé of his recent survey of the activities of the Order.

Thursday afternoon was occupied by a Round Table Discussion for the benefit of one and two nurse districts. At the close of the afternoon tea was served at the National Office.

At the National Victorian Order Nurses' Conference held the two days previous to the Annual Meeting, problems incidental to the conduct of Victorian Order work throughout Canada were discussed. This is the first national Victorian Order Nurses' Conference to be held since 1924. Fifty nurses were registered, the official delegates being: Miss M. Duffield, British Columbia; Miss H. Ash, Alberta; Miss I. Craig, Saskatchewan; Miss Lilly Gray, Manitoba; Miss Edith Campbell, Ontario; Miss M. Moag, Quebec; Miss Ada Burns, New Bruswick; Miss Mary Campbell, Nova Scotia.

REPORTED CASES OF CERTAIN COMMUNICABLE DISEASES IN CANADA* BY PROVINCES—JULY, 1931

Diseases	P.E.I.	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Diphtheria....	9	10	2	93	103	30	7	7	25
Scarlet Fever..	5	20	7	111	210	53	19	25	12
Measles.....	—	4	1	357	570	203	190	2	7
Whooping Cough.....	—	14	—	70	317	12	8	5	21
German Measles....	—	—	—	3	17	†	1	1	—
Mumps.....	—	3	—	9	132	28	76	1	6
Smallpox.....	—	—	—	1	22	—	67	—	4
Cerebrospinal Meningitis..	—	—	—	1	4	—	—	1	1
Anterior Poliomyelitis	—	—	—	4	6	—	—	—	3
Typhoid Fever	—	—	3	76	44	7	2	8	5

*Data furnished by the Dominion Bureau of Statistics, Ottawa.
†Not reportable.

NEWS AND COMMENTS

P. A. T. SNEATH, M.D., D.P.H.

British Columbia

SATISFACTORY arrangements have been completed through the efforts of Dr. Lapp at the Tranquille Sanatorium for the affiliation of nurses from a number of training schools for a two months' course in the Sanitorium. The Sanatorium will pay the railway fare for these students as well as the expense allowance granted by the nurses' own training school.

The Provincial Board of Health Laboratory which has occupied quarters in the Vancouver General Hospital has now been established in separate quarters near the Court House. The Laboratories will serve Greater Vancouver and the lower mainland. Routine laboratory work of the hospital will be carried on in the hospital building. The Laboratories of the Provincial Department are under the direction of Dr. H. W. Hill, Professor of Bacteriology and Public Health Nursing, University of British Columbia.

Alberta

THE Alberta Health Association held its annual meeting in Edmonton in June. Dr. Geraldine Oakley was elected president, Dr. A. M. Lafferty of Lethbridge as vice-president and Dr. R. B. Jenkins of Edmonton as secretary-treasurer. Several of the papers presented at this meeting will be published in the *Journal* during the coming months. It was decided to hold the next annual meeting in Calgary in 1932.

Manitoba

THE establishment of a Manitoba Hospital Commission with wide powers and the division of the province into hospital areas along lines now in force in Alberta was recommended by the select legislative committee appointed at the last session of the legislature. Dr. F. W. Jackson, Deputy Minister of Health and Public Welfare, is now serving as secretary of this committee. It was agreed further that there should be a network of cottage hospitals and clinics to supplement the municipal hospitals. Patients would be distributed according to diagnosis and in cases of major operations and severe illness sent to the larger hospitals. It was the opinion, also, of the committee that Dominion, Provincial and Municipal authorities should co-operate in meeting the responsibility of supplying the necessary health services in preventive and curative medicine. Particularly, it was urged, that children suffering from ailments should be cared for by the state when the parents were financially unable to pay for treatment.

The Annual Meeting of the Manitoba Medical Association will be held in Brandon, Manitoba, September 8th, 9th and 10th. Dr. H. O. McDiarmid, President of the Association, will address the annual luncheon meeting on Wednesday. Dr. Alexander Primrose, Toronto, President-elect of the Canadian Medical Association, and Dr. T. C. Routley, General Secretary, will also address the meeting. A public meeting is being planned for Thursday evening in the lecture theatre in the Brandon Mental Hospital.

Dr. A. T. Mathers of the Faculty of Medicine, University of Manitoba, was selected Dean of the Faculty at a meeting held on August 18th. The appointment of Dr. Mathers was occasioned by the death on August 1st of Dr. F. W. Prowse, M.D., F.R.S.C. (Edin.). Dr. Prowse rendered great service to the University of Manitoba, serving as Dean of the Medical Faculty from 1917.

In accordance with the decision to centre the University of Manitoba on the Agricultural College grounds, plans have been completed for the

erection of a new science building. The new arts building which is nearing completion will be ready for opening this fall, but full use of the building will not be possible until the new science building is erected.

Dr. R. G. Inkster, M.B., Ch.B., F. R.S.C. (Edin.), has been appointed Professor of Anatomy in the University of Manitoba. Dr. Inkster was a member of the Department of Anatomy in Leeds University. He succeeds Dr. J. C. B. Grant who accepted the Chair of Anatomy in the University of Toronto.

A thirty-bed, fireproof addition to the Central Tuberculosis Clinic is being erected on Bannatyne Avenue, Winnipeg, at an approximate cost of $38,000.

An expenditure of $75,000 for the St. Boniface Sanatorium and $230,000 for a new unit for the Mental Hospital at Brandon has been authorized by the Manitoba Government.

Ontario

CONSTRUCTION of a new million dollar wing, Victoria Hospital, London, Ontario, is now assured. Under the plan the Provincial Government will contribute $200,000 in ten annual instalments; the estate of the late Colonel Gartshore will contribute $100,000 and $200,000 will be raised by public subscription. The remaining $500,000 will form a debenture issue.

The Board of Wellesley Hospital, through Dr. Herbert A. Bruce, have generously offered Wellesley Hospital to the Provincial Government for a cancer hospital. It is expected that announcement will be made shortly by the Government concerning this munificent offer following the return of the members of the Royal Commission on Cancer which was appointed by the Government last spring.

Miss Nettie Fidler, formerly a member of the staff of the Toronto General Hospital, has been appointed superintendent of the Psychiatric Hospital, Surrey Place, Toronto. Miss Fidler is a graduate of the Toronto General Hospital.

The American Hospital Association will meet in Toronto during the week of September 28th to October 2nd. The headquarters for the Association will be the Royal York Hotel.

Quebec

CONTRACTS have been let for the construction of a hospital for the Jewish community of Montreal. The institution will be built on Côté de Nieges Road and will cost approximately $1,300,000.

New Brunswick

THE Canadian Nurses' Association will hold its next biennial meeting at Saint John, New Brunswick, June 21-26, 1932. Miss Florence Emory, President of the Association, is convenor of the Programme Committee. The meetings will be held in the Admirable Beatty Hotel. The outstanding topic for discussion will be the Nursing Survey Report.

Nova Scotia

THE third annual convention of the Nova Scotia and Prince Edward Island Hospital Association was held at Windsor, Nova Scotia. The proposal to establish a national hospital organization to be instituted as a council of the various provincial and regional hospital organizations was outlined by Dr. G. Harvey Agnew, Secretary, Department of Hospital Service, Canadian Medical Association, and was heartily endorsed. It is expected that an organization meeting will be held in September to form such a national hospital organization. Miss Mary Beard, R.N., the Assistant Director, the Medical Sciences, the Rockefeller Foundation, spoke on maternal welfare, outlining the training and rôle of the qualified midwives in certain European countries. Miss E. L. Smellie, Superintendent of the Victorian Order of Nurses in Canada, also addressed the convention.

Books and Reports

D. T. Fraser, B.A., M.B., D.P.H.; R. R. McClenahan, B.A., M.B., D.P.H.

Insects, Ticks, Mites and Venomous Animals of Medical and Veterinary Importance, Part II. Public Health. *By Walter Scott Patton, M.B., Ch.B., (Edin.), F.E.S. Dutton Memorial Professor of Entomology; Liverpool University and Liverpool School of Tropical medicine. Crown 8Vo About 740 pages, 388 text figures, 57 plates, 3 in colour and large revision sheet. Price 22/6 or $6.00 in Canada and 'America', post paid. Apply to Miss M. Brown, Department of Entomology, School of Tropical Medicine, Pembroke Place, Liverpool.*

This book is a companion volume to Part I. Medical, and follows a similar arrangement, being divided into nine chapters covering lecture and laboratory work in entomology provided to candidates for the Diploma in Public Health at Liverpool. Appendix I deals with the dissection of the alimentary tract and salivary glands of the mosquito and Appendix II with household arthropods and their control, the latter covering some 340 pages separately indexed.

A great advantage of this book rests upon the correlation of the text and figures, which are most clearly executed, the whole producing a work that, on this subject, is not paralleled, at least in the English language. The common tendency, avoided by the nature of this book, to crush medical entomology into the closing chapters of a text on parasitology demonstrates rather well the prevailing attitude on the part of some Schools and therefore fosters a similar lack of appreciation on the part of our future health officers towards this really valuable subject. The control of the household arthropods is dealt with in a most satisfactory manner by Professor Patton who writes from years of civil and military experience, which should be of a distinct value to those concerned with the storage of food-stuffs and the manufacture of furniture, etc. We find here a positive stimulus to what is often a moribund subject that should afford ideas to the teacher of medical entomology, information to the student of public health and an adequate and interesting volume of reference for the health officer.

Finally we marvel how a book so well conceived, so replete with information of modern vintage, and so ably executed can be published for such a modest fee. P. A. T. S.

BOOKS RECEIVED

Typhoid Fever, its Nature, Mode of Spreading and Prevention by William Budd. Reprinted for Delta Omega Society in 1930 by the American Public Health Association.

Determinative Bacteriology, Volume I: Atlas by Prof. Dr. K. B. Lehmann, Wurzburg and Prof. Dr. R. O. Neumann, Hamburg, translated by Dr. Robert S. Breed, Geneva, N.Y. Published by G. E. Stechert and Co. (Alfred Hafner), New York, 1930.

Determinative Bacteriology, Volume II: Text by Prof. Dr. K. B. Lehmann, Wurzburg and Prof. Dr. R. O. Neumann, Hamburg, translated by Dr. Robert S. Breed, Geneva, N.Y. Published by G. E. Stechert and Co. (Alfred Hafner), New York, 1930.

CURRENT HEALTH LITERATURE

These brief abstracts are intended to direct attention to some articles in various journals which have been published during the preceding month. The Secretary of the Editorial Board is pleased to mail any of the journals referred to so that the abstracted article may be read in its entirety. No charge is made for this service. Prompt return (within three days) is requested in order that the journals may be available to other readers.

Effects of Hypertonic Saline on the Toxaemias of Late Pregnancy—A further timely contribution on this subject to be read with profit by all physicians.

Harding, V. J., and Van Wyck, H. B., Canad. M. J., v. XXIV, No. 5 (May), pp. 635-640.

Primary Peritonitis: Pneumococcic and Streptococcic—This paper will be read with profit by every physician. Dr. Duncan summarizes his findings as follows:

"(1) The report is based on 67 cases of primary peritonitis, all but one from the records of the Hospital for Sick Children, Toronto. These cases occurred between 1919 and 1929.

"(2) Thirty-four were due to pneumococcus and 33 to streptococcus.

"(3) Fifty per cent of the cases occurred between three and eight years of age.

"(4) Eighty per cent of the cases were females, the percentage being higher among the pneumococcic cases than among streptococcic.

"(5) There are at least three portals of entry for the infection; by the genital tract, by the blood stream, and by way of the intestinal tract.

"(6) The diagnosis from acute appendicitis is discussed.

"(7) There was a general mortality rate of 68.6 per cent; for the pneumococcic 59 per cent; and for the streptococcic 80 per cent.

"(8) The opinion is expressed that operation should not be undertaken in the early stages, but that the patient should be given fluid, saline and glucose, blood transfusion and adequate amounts of anti-pneumococcic or anti-streptococcic serum until the condition has become localized."

Duncan, J. H., Canad. M. A. J., v. XXIV, No. 6 (June), pp. 778-784.

Immunization of Dogs Against Rabies by the One-Injection Method—The author reviews the work on vaccination of dogs against rabies by Umeno and Doi and evaluates the method by answering the following questions: Does it immunize? Is it safe? How long does immunity last? "It would appear" he answers, "that phenol-killed vaccines are capable of producing immunity in dogs when given in 1 dose, but also that failures of this type of vaccine are to be expected, and a false sense of security should not obtain because of vaccination. The possibilities of post-vaccinal paralysis with this type of vaccine should be recognized and no absolute assurance should be given that no harm to the dog will result." Immunity should not be considered to last for more than one year. In some cases it may last only for a shorter time. The author concludes: "The reduction of the susceptibility of a dog population to rabies infection is a step forward in the control of the disease, but the rigid enforcement of

such standard measures as the destruction of stray dogs and quarantine is absolutely necessary for the solving of the rabies problem."

Schoening, H. W., V. M. D., Am. J. Pub. Health, v. XXI, No. 6 (June), pp. 637-640.

A Few Thoughts on the Problem of Sickness Insurance from a Country Doctor—Dr. English discusses the question of state medicine from the standpoint of "the man on the street" and from the standpoint of the doctor. He outlines the system of sickness insurance which has come under his observation through which medical service is supplied to the workman and his dependents on payment of a monthly sum in no case to exceed 5 per cent of his monthly wage. Dr. English states, "So far this plan has worked out to the satisfaction of everyone. The workman on employment is given a complete physical examination and so the plant is assured of sound human machinery as well as sound mechanical machinery. Preventive work may be done to lessen the production costs by the illness of a skilled workman and to lessen the cost of illness to the workman himself. The workman is relieved of financial worry in relation to any illness in his family and the doctor is not required to do bookkeeping and collecting and his income is more or less fixed. In addition the preventive work that the doctor does does not cost him money. An elaboration of such a scheme will, it is believed, be in force throughout the province of Ontario within the next ten or fifteen years. The public are demanding a change, and is it not better that the profession should control it, rather than that the state or private interests should step in?"

English, S., Canad. M. A. J., v. XXIV, No. 6 (June), pp. 826-827.

Fungus Infections of Skin of Industrial Workers—A temperature of from 75° to 100° C. will destroy trichophyton spores. For disinfection of shoes, alcohol or gasoline, containing 1 per cent thymol, seems very effective. Bichloride of mercury, 1-1000, is of value in disinfecting floors, serving as an effective economical fungicide when added to floor cleaning compounds. "Never place the bare feet upon the floors or shower baths in public places" is a message which should be broadcasted in the interests of prevention of ringworm of the feet.

Legge, R. T., Am. J. Pub. Health, v. XXI, No. 6 (June), pp. 648-652.

A Report on Three Outbreaks of Food Poisoning—Three outbreaks of the same clinical type and apparently due to the same group of bacterial organisms. It is interesting to note that two of the outbreaks occurred in hospitals. The first was at Sacramento, California, noting 35 cases; the second, a hospital outbreak in San Francisco with 200 cases; and the third, a hospital at Oakland with 52 cases. The first was probably due to B. enteritidis, the second to B. paratyphosus B (aertrycke type) and the third to B. paratyphosus A.

Geiger, J. C., Nelson, Margaret and Gray, J. P., Pub. Health Rep., v. 46, No. 27 (July 3), pp. 1565-1572.

The White House Conference on Child Health Protection—An excellent summary of the proceedings of this important conference.

Child and Family Welfare, v. VII, No. 2 (July), pp. 3-26.